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for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



MITSUBISHI ELECTRIC CORPORATION

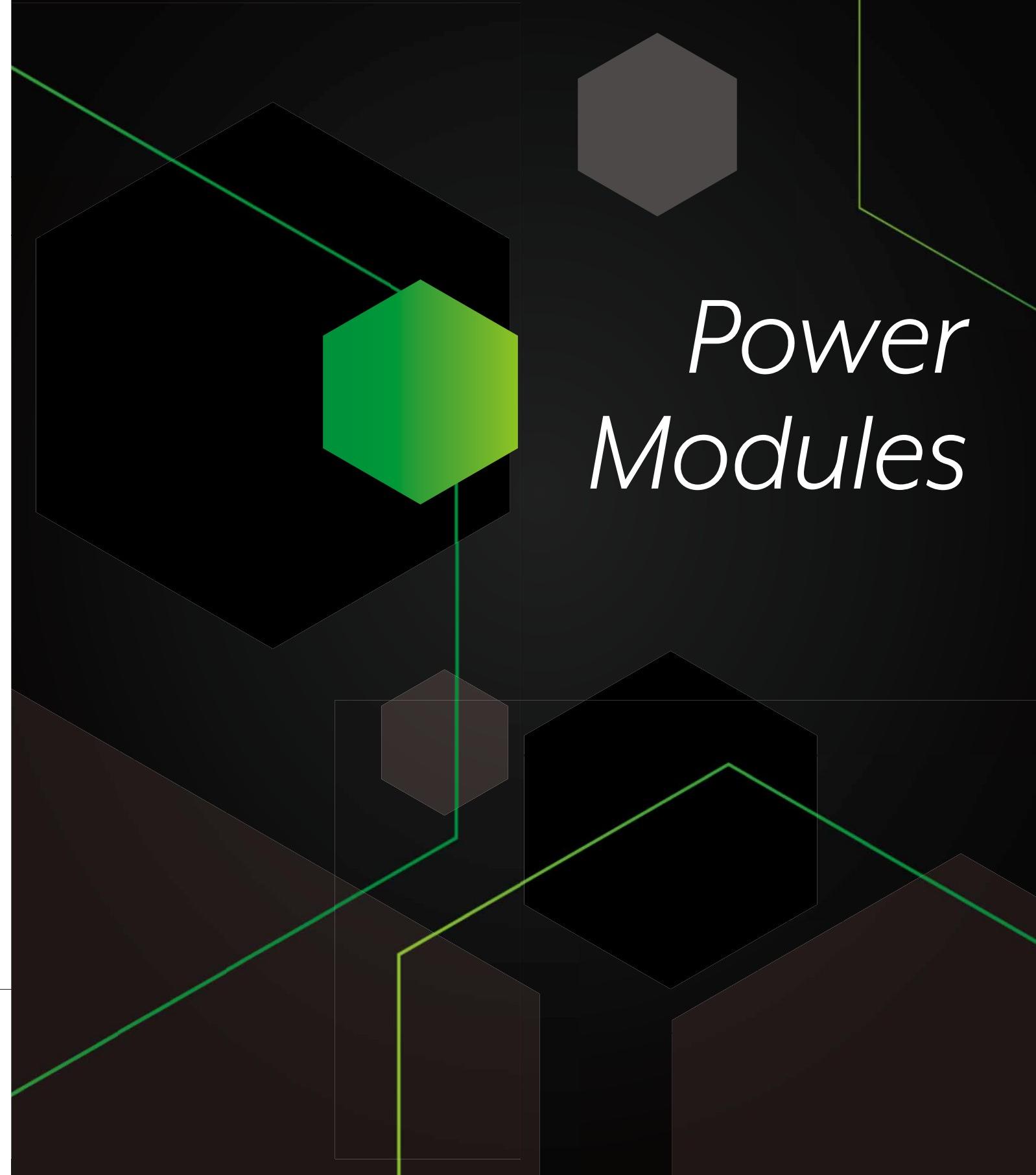
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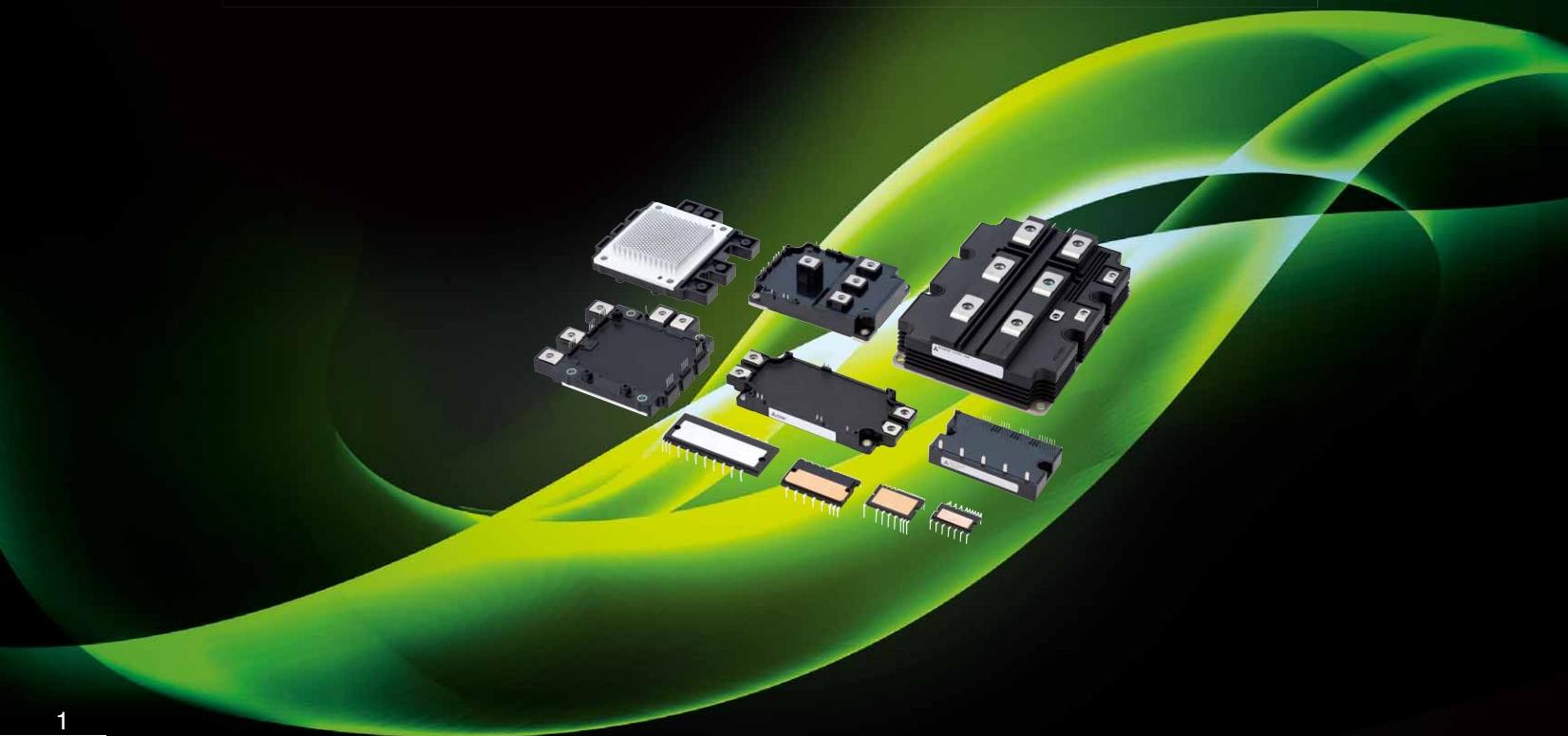
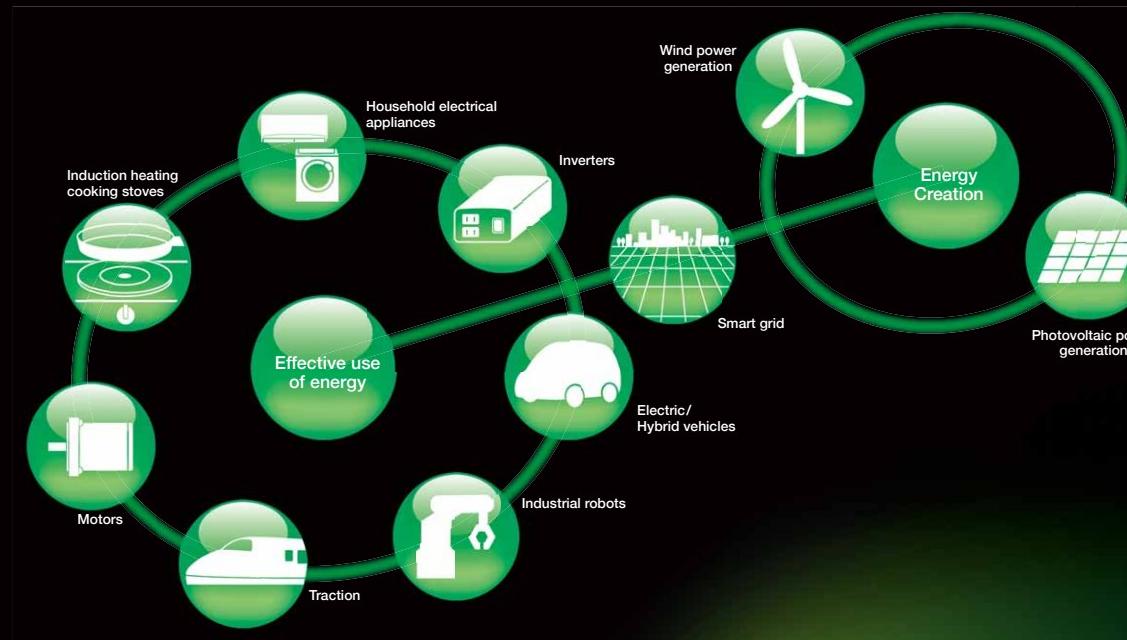
POWER MODULES

Power Modules



Innovative Power Devices for a Sustainable Future

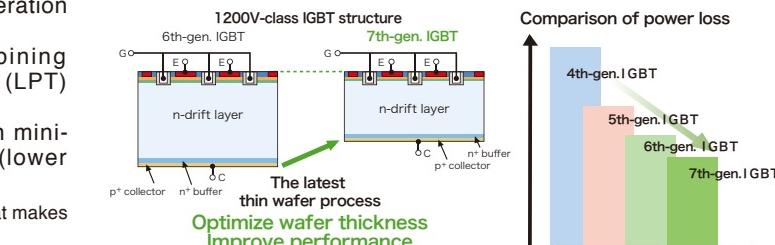
Mitsubishi Electric power modules are at the forefront of the latest energy innovations that seek to solve global environmental issues while creating a more affluent and comfortable society for all. Some of these innovations are photovoltaic (PV) and wind power generation from renewable energy sources, smart grids realizing efficient supply of power, hybrid/electric vehicles (HVs/EVs) that take the next step in reducing carbon emissions and fuel consumption, and home appliances that achieve ground-breaking energy savings. Whether in appliances, railcars, EVs or industrial systems, our power modules are key elements in changing the way energy is used.



Focus Technology

7th-Generation 1,200V-Class IGBT Chip Technology Cutting-edge technology realizes energy-saving inverter devices

- Latest thin-wafer processing (n-drift layer) achieves thinner wafer than 6th-generation devices
 - Performance improved by combining CSTBT™* and light punch-through (LPT) structures
 - Inverter system power dissipation minimized by its superior performance(lower VCE_{sat} and Eoff)
- *CSTBT: Mitsubishi Electric's unique IGBT that makes use of carrier cumulative effect



A small surface mount package IPM has been newly developed for fan and low-power motor drive applications

Key Features

- Optimal pin layout realizes easier PCB wiring design and enables smaller PCB size
- Newly integrated interlock function in addition to conventional protection features for robust operation
- Bootstrap diode is integrated for the P-side drive power supply like conventional DIPIPM™ series, reducing the number of peripheral



Modules realizing single-control power supply and photocoupler-less systems for household appliances and low-capacity inverters

Key Features

- Transfer-molded structure incorporating a high thermal conductivity insulation sheet provides heat
- High-voltage IC equipped with drive, protection and level-shift circuits for direct control via input signals from a CPU or microcomputer
- Compact board and highly reliable equipment realized through single power-supply and photocoupler-less systems
- Includes built-in bootstrap diode (BSD)



Modules with built-in control and protection circuits for AC servo robots and PV power generation

Key Features

- Built-in protection circuits for short-circuiting, power supply undervoltage and overheating
- Highly compatible package with simplified printed circuit board (PCB) design
- Special intelligent power modules (IPMs) for power conditioners in PV power generation systems



IGBT modules for general-purpose inverters used in various applications

Key Features

- Various low-inductance packages and power chips available
- Compatible with high-frequency, high-voltage (1,700V) applications
- Large-capacity modules available for renewable energy systems



High voltage, large capacity and high reliability are realized for traction and power transmission application

Key Features

- Two types of package are realized: "std type" with large output power and "LV100/HV100 type" for various inverter capacity by easy parallel connection
- The abundant field experience more than 20 years especially in the application of bullet train
- High reliability due to a long lifetime design and a robust design against severe environment



Modules realizing high performance and reliability for propulsion inverters in HVs/EVs

Key Features

- Built-in temperature analog output function realizing highly reliable drive train
- High-power/temperature cycle life ensures high reliability
- Compliant with the End-of-life Vehicles Directive, regulations relating to substances of environmental concern
- High traceability in managing materials/components throughout the entire production process for each product



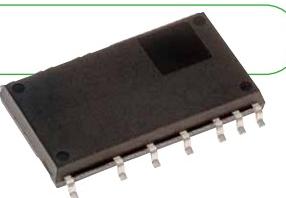
Surface mount package IPM



New Products

Surface mount package IPM MISOPT™

SP1SK, SP1SL, SP3SK and SP3SL



A small Surface mount package IPM has been newly developed for fan and low-power motor drive applications

<Main Features>

- Optimal pin layout realizes easier PCB wiring design and enables smaller PCB size
- Insulation distance between pins ensured, realizing easier board mounting without coating process
- Newly integrated interlock function in addition to conventional protection features for robust operation
- Installing RC-IGBT¹ simultaneously realizes compact package and low loss performance can go together
- Bootstrap diode is integrated for the P-side drive power supply like conventional DIPIPMTM series, reducing.

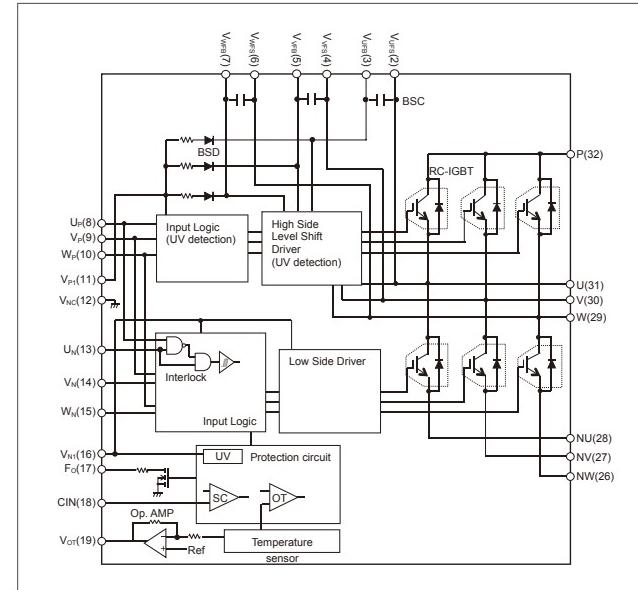
¹ Reverse-conducting IGBT

Type name	Current ratio	Voltage ratio	Chips	BSC	Protection	Shape
SP1SK**	1A	600V	RC-IGBT	-	UV	Surface mount package
SP1SL**			HVIC×1	Embedded	SC	
SP3SK**			LVIC×1	-	OT	
SP3SL**			BSD×3	Embedded	VOT	

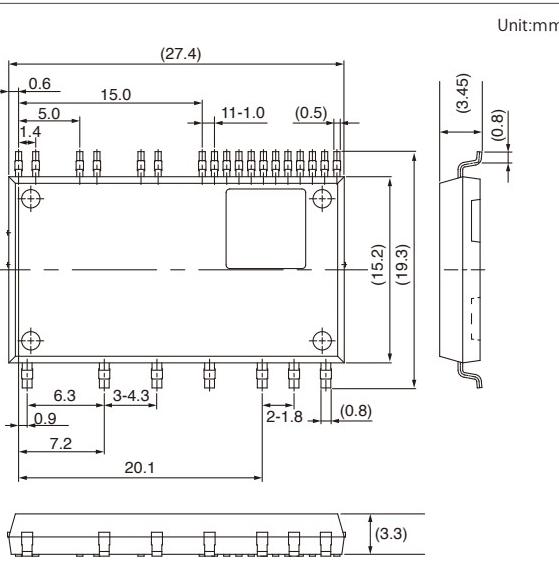
★★:Under development

[Term] VOT: Analog temperature output
UV : Power supply under-voltage protection
SC : Short-circuit protection
OT : Over Temperature protection
IL : Inter Lock
BSC : Bootstrap capacitor

Schematic drawing



Outline Drawing



Feature Products

Smaller package size realized by integrating newly designed RC-IGBT
Recommended for low-cost inverter and fan controller applications

SLIMDIP™ SLIMDIP-S, SLIMDIP-L

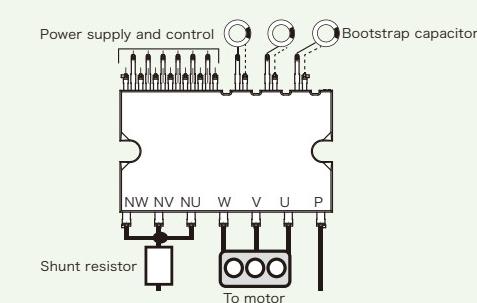
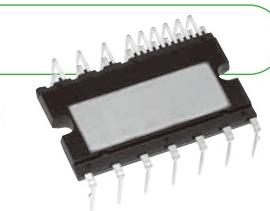
<Main Features>

- RC-IGBT¹ incorporated, reducing package size 30% compared to Super-mini DIPIPM
- Maximum case temperature increased from 100°C to 115°C, increasing the operating temperature range and leading to easier system design
- Additional terminals for floating supply and built-in bootstrap diodes simplify PCB wiring pattern
- Both VOT² and OT³ functions integrated for temperature protection

*1 RC-IGBT: Reverse conducting IGBT

*2 VOT: Temperature information output function

*3 OT: Over-temperature protection function



Feature Products

All-in-one intelligent power modules equipped with 3-phase converter and brake circuit in addition to inverter circuit

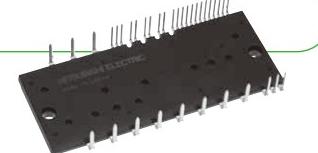
DIPIPM+™ PSS05MC1FT, PSS10MC1FT, PSS15MC1FT, PSS25MC1FT, PSS35MC1FT, PSS50MC1F6

<Main Features>

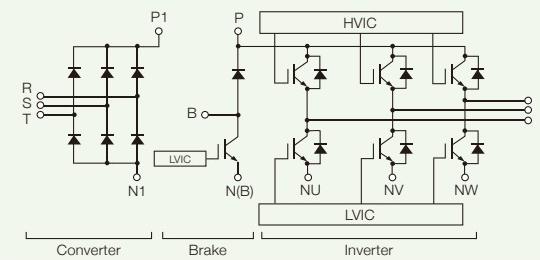
- Encapsulated with transfer molded resin, integrates three-phase converter, inverter, brake and control IC
- Built-in converter and brake enable system size to be reduced and save design cost, contributing to total cost reduction
- Lower PCB inductance pattern reduces noise, thereby reducing design time and countermeasure parts required for noise reduction
- Built-in BSD¹ with 1,200V withstand voltage reduces number of external parts and improves reliability

*1 BSD: Bootstrap diode

*2: Available without brake circuit

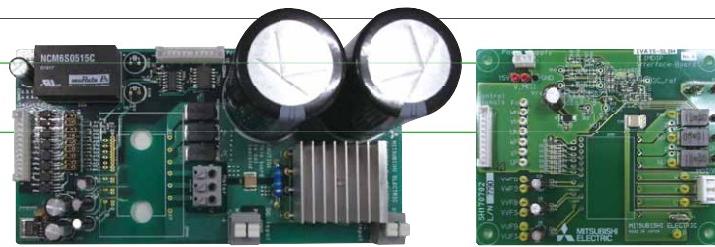


Internal circuit diagram



Customer Support

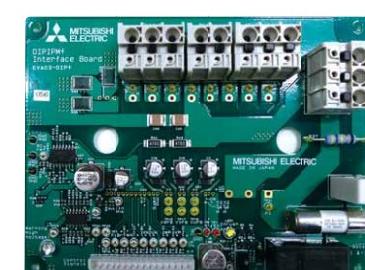
EVA series, evaluation boards for each DIPIPMTM
Various evaluation boards to easy support system design



Super mini DIPIPM™ evaluation board EVA11-SDIP



DIPIPM+ evaluation board EVA14-DIP+



DIPIPM+ evaluation board EVA03-DIP+

* For further information, please contact sales office.

Line-up of DIPIPM™

■ Series Matrix of 600V / 500V DIPIPM™

Ic (A)	Series	SLIMDIP	600V			500V		
			Super mini	Mini	Large	CIB/CI	Super mini	
			Ver.6		Ver.4	DIPIPM+	MOSFET	
3	SLIMDIP-S SLIMDIP-L						PSM03S93E5-A	
5			PSS05S92F6-AG PSS05S92E6-AG	PSS05S51F6 PSS05S51F6-C			PSM05S93E5-A	
10			PSS10S92F6-AG PSS10S92E6-AG	PSS10S51F6 PSS10S51F6-C				
15			PSS15S92F6-AG PSS15S92E6-AG	PSS15S51F6 PSS15S51F6-C		PSM15S94H6-A		
20			PSS20S92F6-AG PSS20S92E6-AG	PSS20S51F6 PSS20S51F6-C PSS20S71F6			PSM20S94H6-A	
30			PSS30S92F6-AG PSS30S92E6-AG	PSS30S71F6				
35			PSS35S92F6-AG PSS35S92E6-AG					
50				PSS50S71F6	PS21A79	PSS50MC1F6 PSS50NC1F6 *5		
75					PS21A7A			
Chip	IGBT/MOSFET	RC-IGBT	CSTBT	CSTBT	CSTBT	SJ-MOSFET	MOSFET	
UV		P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side/Brake part	P-side/N-side	P-side/N-side	
SC		N-side	N-side	N-side with sense	N-side	N-side	N-side	
OT		N-side	N-side*1	—	—	—	N-side	
VOT		N-side	N-side*1	N-side	N-side	N-side	—	
Active input		High(3/5V)	High(3/5V)	High(3/5V)	High(5V)	High(3/5V)	High(3/5V)	
Emitter pin of N-side		Open	Open	Open	Open	Open	Open	
Fault output		N-side(UV,SC,OT)	N-side (UV,SC,OT)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC,OT)	
Insulation voltage		2000Vrms	1500Vrms*2	2500Vrms	2500Vrms	1500Vrms*2	1500Vrms*2	
Insulation structure		Insulation sheet	Insulation sheet	Molding resin*4/Insulation sheet	Insulation sheet	Insulation sheet	Insulation sheet	
RoHS directive		Compliant	Compliant	Compliant *3	Compliant	Compliant	Compliant	
Pin type		Control side of zigzag (Long, Short)	Long	C: Control side of zigzag None: Short	—	—	Long	Long

[Notes] *1 : PSSxxS92E6 has OT function, PSSxxS92F6 has V_{OT} function

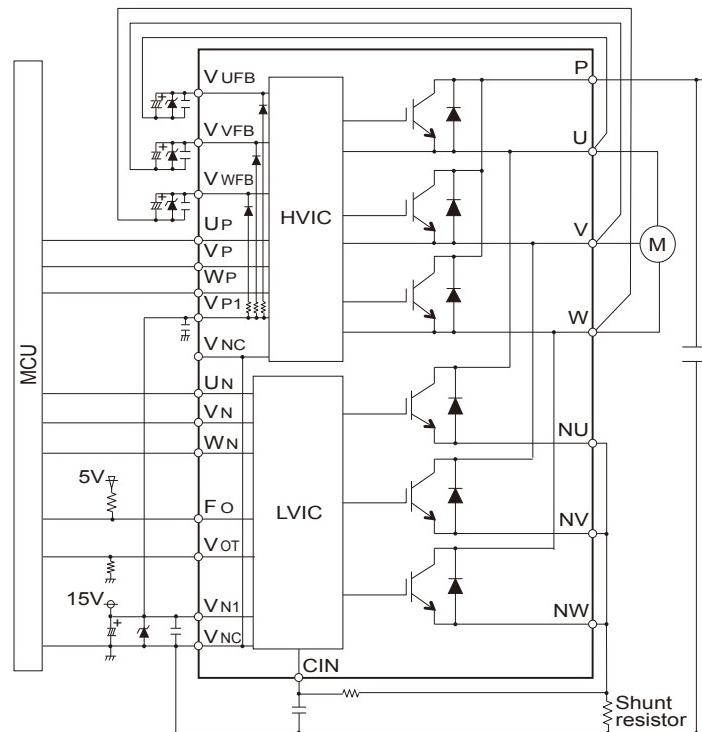
*2 : AC60Hz,1minute.Coriresponds to isolation voltage 2500Vrms
in the case the convex-shaped heat sink

*3 : High melting point solder (Lead Over 85%) is used
for chip soldering of PSSxxS51F6 only.

*4 : Molding resin insulation for PSSxxS51F6-C

*5 : PSS50NC1F6 is not included brake.

■ Application circuit of super mini DIPIPM™



[Term] CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

RC-IGBT: Reverse conducting IGBT

HVIC: High Voltage IC, LVIC: Low Voltage IC,

BSD: Bootstrap Diode

UV: Supply Under Voltage protection,

OT: Over Temperature protection,

SC: Short Circuit protection

VOT: Analog temperature output

RoHS: Restriction of the use of certain Hazardous Substances

in electrical and electronic equipment

CIB: Converter Inverter Brake,

CI: Converter Inverter

■ Series Matrix of 1200V DIPIPM™

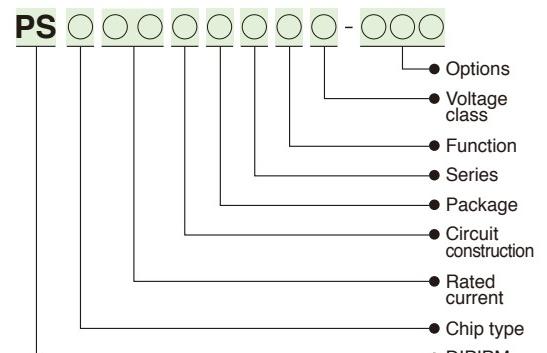
Ic (A)	Series	Mini	1200V		
			Large		DIPIPM+
			Ver.6	Ver.4	CIB/CI
5	Protective Function	PSS05S72FT	PSS05SA2FT	PS22A72	PSS05MC1FT PSS05NC1FT*1
10		PSS10S72FT	PSS10SA2FT	PS22A73	PSS10MC1FT PSS10NC1FT*1
15			PSS15SA2FT	PS22A74	PSS15MC1FT PSS15NC1FT*1
25			PSS25SA2FT	PS22A76	PSS25MC1FT PSS25NC1FT*1
35			PSS35SA2FT	PS22A78-E	PSS35MC1FT PSS35NC1FT*1
50			PSS50SA2FT	PS22A79	
75			PSS75SA2FT*		
Chip	IGBT/MOSFET	CSTBT	CSTBT	CSTBT	CSTBT
UV	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side	P-side/N-side
SC	N-side	N-side	N-side with sense	N-side	N-side
OT	N-side	N-side*1	—	—	—
VOT	N-side	N-side*1	N-side	N-side	N-side
Active input	High(3/5V)	High(3/5V)	High(3/5V)	High(5V)	High(3/5V)
Emitter pin of N-side	Open	Open	Open	Open	Open
Fault output	N-side(UV,SC,OT)	N-side (UV,SC,OT)	N-side (UV,SC)	N-side (UV,SC)	N-side (UV,SC,OT)
Insulation voltage	2000Vrms	1500Vrms*2	2500Vrms	2500Vrms	2500Vrms
Insulation structure	Insulation sheet	Insulation sheet	Molding resin*4/Insulation sheet	Insulation sheet	Insulation sheet
RoHS directive	Compliant	Compliant	Compliant *3	Compliant	Compliant
Pin type	Control side of zigzag (Long, Short)	Long	C: Control side of zigzag None: Short	—	Long

★: New Product Non-recommended : Please contact to the sales offices.

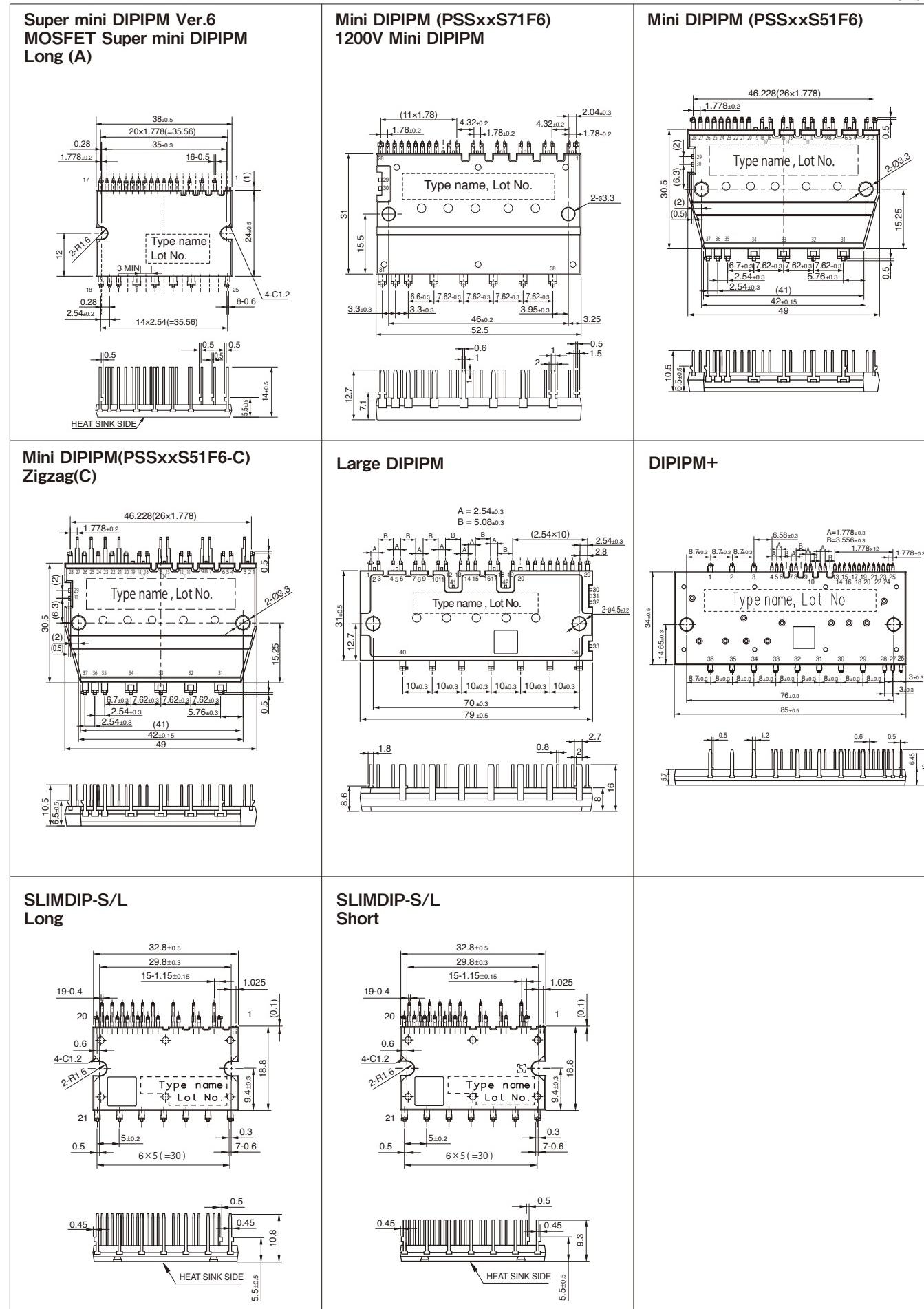
[Notes] *1: PSS**NC1FT is not included brake

[Term] BSD: Bootstrap Diode
CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect.
HVIC: High Voltage IC, LVIC: Low Voltage IC
UV: Supply Under Voltage protection, OT: Over Temperature protection, SC: Short Circuit protection
VOT: Analog temperature output
RoHS: Restriction of hazardous substances in electrical and electronic equipment
CIB: Converter Inverter Brake, CI: Converter Inverter

■ Type Name Definition of DIPIPM™



Outline Drawing of DIPIPM™



New Products

Loaded with built-in functions, contributing to inverters with enhanced energy savings

G1 Series IPM with 7th-generation IGBT

<Main Features>

- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT™¹ and a diode incorporating a RFC² structure that contributes to reducing the power consumed in inverters
- The new resin-insulated metal baseplate, originally introduced in 7th-generation IGBT modules, eliminates the solder-attached section, increasing the thermal cycle lifetime and improving inverter reliability
- In addition to the built-in functions of the previous product,³ automatic switching speed control, error detection function and Bootstrap diode (BSD)⁴ contribute to lowering inverter loss and shortening design time
- The introduction of PC-TIM⁵ contribute to simplifying the inverter assembly process (optional)

*1 CSTBT™: Mitsubishi Electric's unique IGBT that utilizes the carrier cumulative effect

*2 RFC: Relaxed field cathode

*3 Conventional product: IPM L1-Series

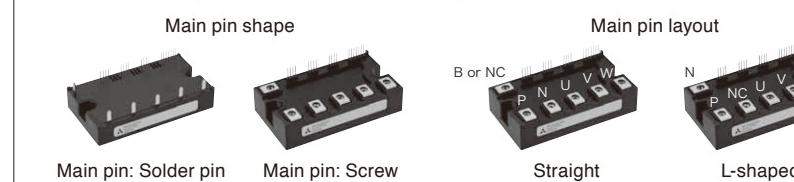
Built-in functions: Supply Undervoltage lock protection (UV), Short-circuit protection (SC), Over-temperature protection (OT)

*4 Bootstrap diode (BSD): Optional products include 50A, 75A, 100A/650V, 25A, 50A/1200V

*5 PC-TIM: Phase change-thermal interface material

■ "A" package main pin shape and layout

For the "A" package 6-in-1 (CG1A) main pin shape, select either solder pin or screw type
For the pin layout, select either straight or L-shaped



■ Lineup

V _{CES} (V)	Package	Main pin shape	Main pin layout	I _c (A)								
				25	35	50	75	100	150	200	300	450
650V	A package	Screw	Straight			PM50CG1A065*	PM75CG1A065*	PM50RG1A065*	PM75RG1A065*	PM100CG1A065*		
			L-shaped			PM50CG1AL065*	PM75CG1AL065*	PM100CG1AL065*				
	Solder pin		Straight			PM50CG1AP065*	PM75CG1AP065*	PM50RG1AP065*	PM75RG1AP065*	PM100CG1AP065*		
			L-shaped			PM50CG1APL065*	PM75CG1APL065*	PM100CG1APL065*				
	B package	Screw	L-shaped			PM50CG1B065*	PM75CG1B065*	PM100CG1B065*	PM150CG1B065*	PM200CG1B065*		
						PM50RG1B065*	PM75RG1B065*	PM100RG1B065*	PM150RG1B065*	PM200RG1B065*		
1200V	A package	Screw	Straight	PM25CG1A120*	PM35CG1A120*	PM35RG1A120*	PM50CG1A120*					
			L-shaped	PM25CG1AL120*	PM35CG1AL120*	PM50CG1AL120*						
	Solder pin		Straight	PM25CG1AP120*	PM35CG1AP120*	PM35RG1AP120*	PM50CG1AP120*					
			L-shaped	PM25CG1APL120*	PM35CG1APL120*	PM50CG1APL120*						
	B package	Screw	L-shaped	PM25CG1B120*	PM35CG1B120*	PM50CG1B120*	PM75CG1B120*	PM100CG1B120*				
				PM25RG1B120*	PM35RG1B120*	PM50RG1B120*	PM75RG1B120*	PM100RG1B120*				
	C package	Screw	L-shaped					PM100CG1C120*	PM150CG1C120*	PM200CG1C120*		

★: New Product

Representative reference is "A" package with screw terminal and straight layout (CG1A).

Line-up of IPM

■ Matrix of IPM Modules 650V/600V (No.: Number of outline drawing, see page 11 to 12)

Vces(V) Series Ic(A)	650V		600V		Photovoltaic		L Series		
	G1 Series		L1 Series		S1 Series		V1 Series		
	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	
50	PM50CG1A065*	C 12	PM50CL1A060 C 01 PM50CL1B060 C 02 PM50RL1A060 R 01 PM50RL1B060 R 02 PM50RL1C060 R 03	PM50CS1D060 C 05	PM50B4LA060 B4 01	PM50B5LA060 B5 01	PM50B6LA060 B6 01	PM50CLA060 C 02	
	PM50RG1A065*	R 12			PM50B4LB060 B4 02	PM50B5LB060 B5 02	PM50B6LB060 B6 02	PM50CLB060 C 02	
	PM50CG1B065*	C 10			PM50B4LA060 B4 03	PM50B5LA060 B5 03	PM50B6LA060 B6 03	PM50CLA060 C 03	
	PM50RG1B065*	R 10			PM50B4LB060 B4 03	PM50B5LB060 B5 03	PM50B6LB060 B6 03	PM50CLB060 C 03	
	PM50CG1AL065*	C 12			PM50B4LA060 B4 03	PM50B5LA060 B5 03	PM50B6LA060 B6 03	PM50CLA060 C 03	
	PM50CG1AP065*	C 09			PM50B4LB060 B4 03	PM50B5LB060 B5 03	PM50B6LB060 B6 03	PM50CLB060 C 03	
	PM50CG1APL065*	C 09			PM50B4LA060 B4 03	PM50B5LA060 B5 03	PM50B6LA060 B6 03	PM50CLA060 C 03	
	PM50RG1AP065*	R 09			PM50B4LB060 B4 03	PM50B5LB060 B5 03	PM50B6LB060 B6 03	PM50CLB060 C 03	
	PM50RG1AP065*	R 09			PM50B4LA060 B4 03	PM50B5LA060 B5 03	PM50B6LA060 B6 03	PM50CLA060 C 03	
75	PM75CG1A065*	C 12	PM75CL1A060 C 01 PM75CL1B060 C 02 PM75RL1A060 R 01 PM75RL1B060 R 02	PM75CS1D060 C 05	PM75B4LA060 B4 01	PM75B5LA060 B5 01	PM75B6LA060 B6 01	PM75CLA060 C 02	
	PM75RG1A065*	R 12			PM75B4LB060 B4 02	PM75B5LB060 B5 02	PM75B6LB060 B6 02	PM75CLB060 C 02	
	PM75CG1B065*	C 10			PM75B4LA060 B4 03	PM75B5LA060 B5 03	PM75B6LA060 B6 03	PM75CLA060 C 03	
	PM75RG1B065*	R 10			PM75B4LB060 B4 03	PM75B5LB060 B5 03	PM75B6LB060 B6 03	PM75CLB060 C 03	
	PM75CG1AL065*	C 12			PM75B4LA060 B4 03	PM75B5LA060 B5 03	PM75B6LA060 B6 03	PM75CLA060 C 03	
	PM75CG1AP065*	C 09			PM75B4LB060 B4 03	PM75B5LB060 B5 03	PM75B6LB060 B6 03	PM75CLB060 C 03	
	PM75CG1APL065*	C 09			PM75B4LA060 B4 03	PM75B5LA060 B5 03	PM75B6LA060 B6 03	PM75CLA060 C 03	
	PM75RG1AP065*	R 09			PM75B4LB060 B4 03	PM75B5LB060 B5 03	PM75B6LB060 B6 03	PM75CLB060 C 03	
	PM75RG1AP065*	R 09			PM75B4LA060 B4 03	PM75B5LA060 B5 03	PM75B6LA060 B6 03	PM75CLA060 C 03	
100	PM100CG1A065*	C 12	PM100CL1A060 C 01 PM100CL1B060 C 02 PM100RL1A060 R 01 PM100RL1B060 R 02	PM100CS1D060 C 05	PM100CLA060 C 01	PM100RLA060 R			
	PM100CG1B065*	C 10			PM100CLA060 C 01	PM100RLA060 R			
	PM100RG1B065*	R 10			PM100CLA060 C 01	PM100RLA060 R			
	PM100CG1AL065*	C 12			PM100CLA060 C 01	PM100RLA060 R			
	PM100CG1AP065*	C 09			PM100CLA060 C 01	PM100RLA060 R			
	PM100CG1APL065*	C 09			PM100CLA060 C 01	PM100RLA060 R			
	PM100CG1APL065*	C 09			PM100CLA060 C 01	PM100RLA060 R			
	PM150CG1B065*	C 10	PM150CL1A060 C 01 PM150CL1B060 C 02 PM150RL1A060 R 01 PM150RL1B060 R 02	PM150CS1D060 C 05	PM150CLA060 C	PM150RLA060 R			
	PM150RG1B065*	R 10							
150	PM200CG1B065*	C 10	PM200CL1A060 C 04 PM200CL1B060 C 04 PM200RL1A060 R 04 PM200RL1B060 R 04	PM200CS1D060 C 05	PM200CLA060 C	PM200RLA060 R			
	PM200RG1B065*	R 10							
	PM200CG1C065*	C 11							
	PM200RG1C065*	R 11							
	PM300CG1C065*	C 11	PM300CL1A060 C 04 PM300RL1A060 R 04		PM300CLA060 C	PM300RLA060 R			
	PM300RG1C065*	R 11							
400/450	PM450CG1C065*	C 11	PM400DV1A060 D 06 PM800DV1B060 D 07		PM450CLA060 C 08				
	PM450RG1C065*	C 11							
	PM600DV1A060	D 06			PM600CLA060 C 08				
	PM800DV1B060	D 07							
	CSTBT*1	CSTBT*1	CSTBT*1	CSTBT*1	CSTBT*2				
	Emitter sensor installed	Built-in emitter sensor	Built-in emitter sensor	Built-in emitter sensor	Built-in emitter sensor				
	Temperature sensor installed	Built-in temperature sensor	Built-in temperature sensor	Built-in temperature sensor	Built-in temperature sensor				
	IGBT chip								
Fault output	UV	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side		
	OT	P-side/N-side	P-side/N-side	N-side	P-side/N-side	P-side/N-side	P-side/N-side		
Identification	P-side/N-side	—	—	—	—	—	—		
	Rohs directive	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant		
Compatibility	—	L Series	S-DASH SERVO	V Series	—	—	—		
	Connection	D	B4	B5	B6	C	R		

★: New Product Non-recommended : Please contact to the sales offices.

[Notes] *1: Full-gate CSTBT™ *2: PCM (Plugged Cell Merged) CSTBT™

[Term] UV: Supply Under Voltage-lock protection, SC: Short-Circuit protection, OT: Over-temperature protection,

OC: Over-current protection, CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

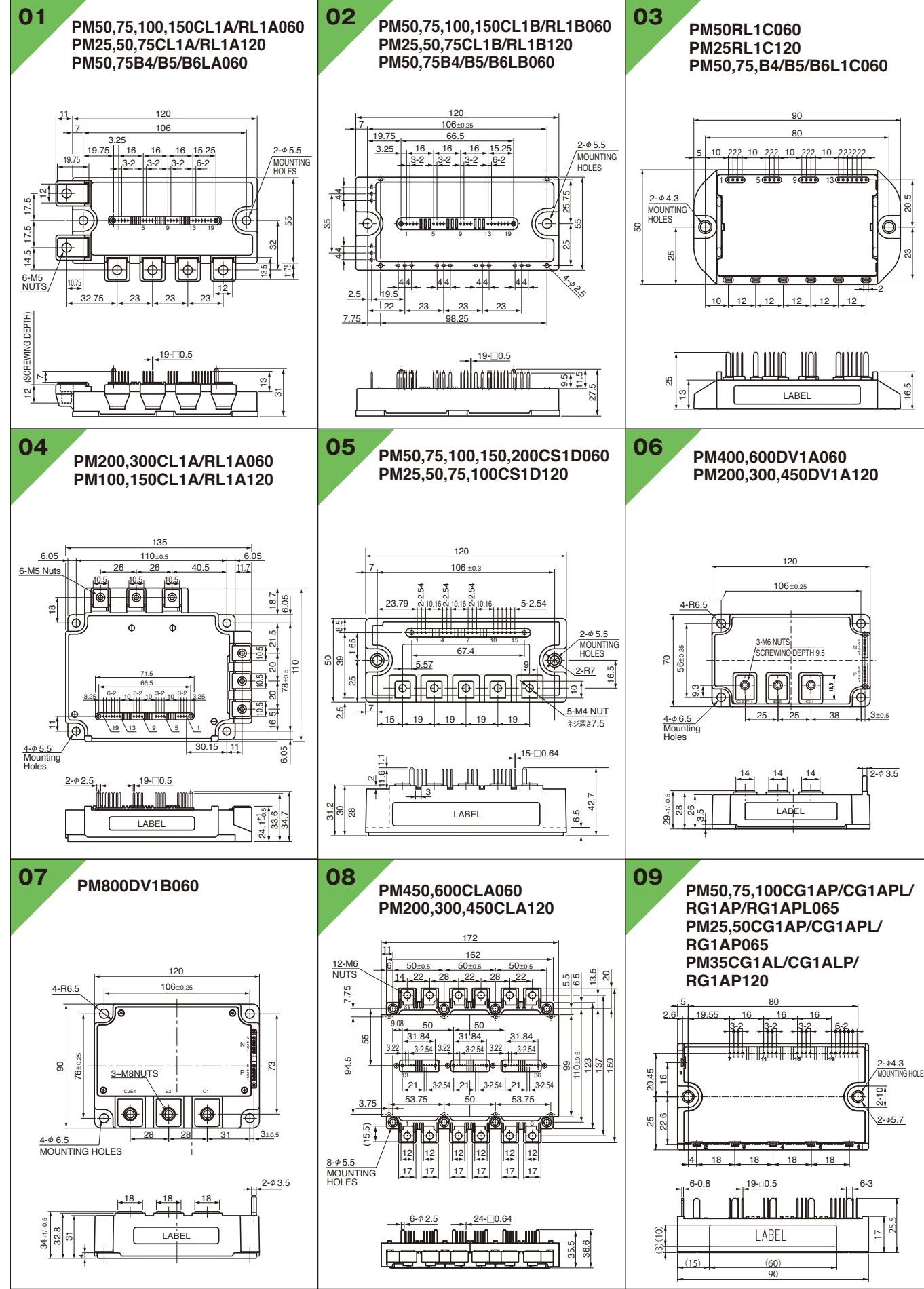
RoHS: Restriction of hazardous substances in electrical and electronic equipment

■ Matrix of IPM Modules 1200V (No.: Number of outline drawing, see page 11 to 12)

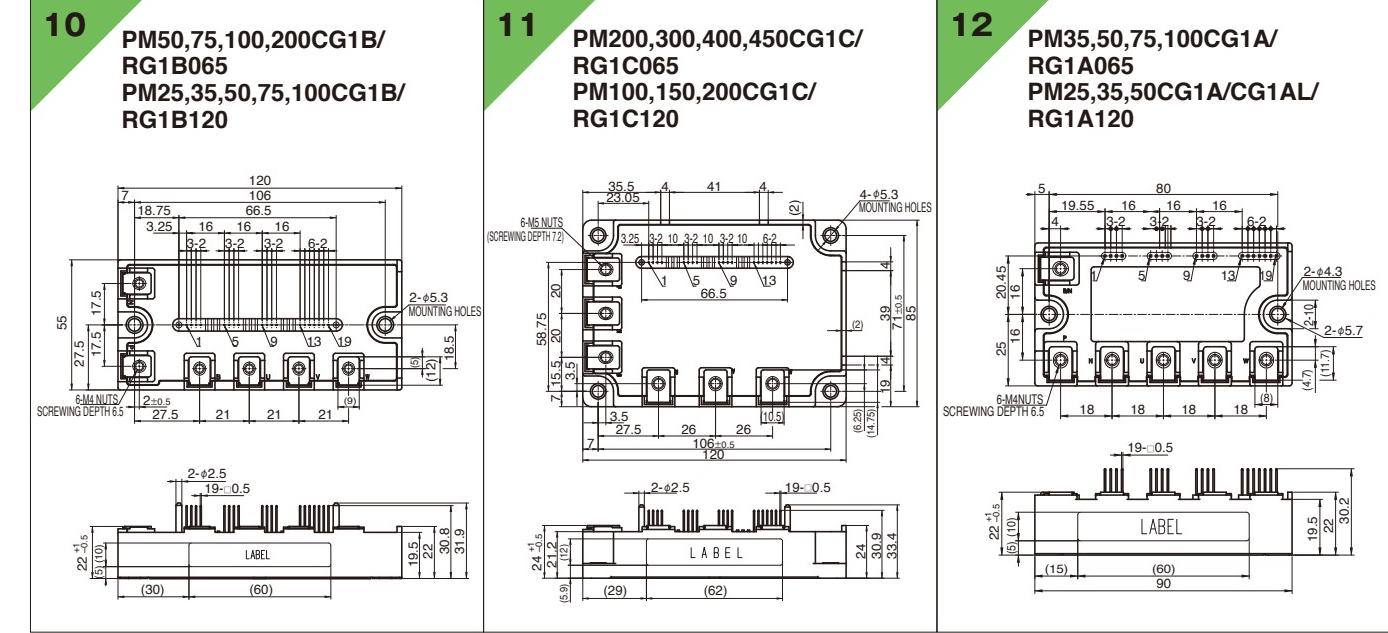
Vces(V) Series Ic(A)	G1 Series		L1 Series		S1 Series		V1 Series		L Series	
	Connection No.	No.	Connection No.	No.	Connection No.	No.	Connection No.	No.	Connection No.	No.
25	PM25CG1A120*	C 12	PM25CL1A120 C 01 PM25CL1B120 C 02 PM25RL1A120 R 01 PM25RL1B120 R 02 PM25CG1AL120* C 09 PM25CG1AP120* C 09 PM25RG1AP120* R 09	PM25CS1D120 C 05	PM25B4LA060 B4 01	PM25B5LA060 B5 01	PM25B6LA060 B6 01	PM25CLA060 C 02		
	PM25CG1B120*	C 10								
	PM25RG1A120*	R 12								
	PM25RG1B120*	R 10								
	PM25CG1AL120*	C 12								
	PM25CG1AP120*	C 09								
	PM25RG1AP120*	R 09								
	PM35CG1A120*	C 12	PM35CL1A120 C 01 PM35CL1B120 C 02 PM35RL1A120 R 01 PM35RL1B120 R 02 PM35CG1AL120							

Line-up of IPM

Outline Drawing of IPM



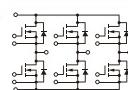
Outline Drawing of IPM



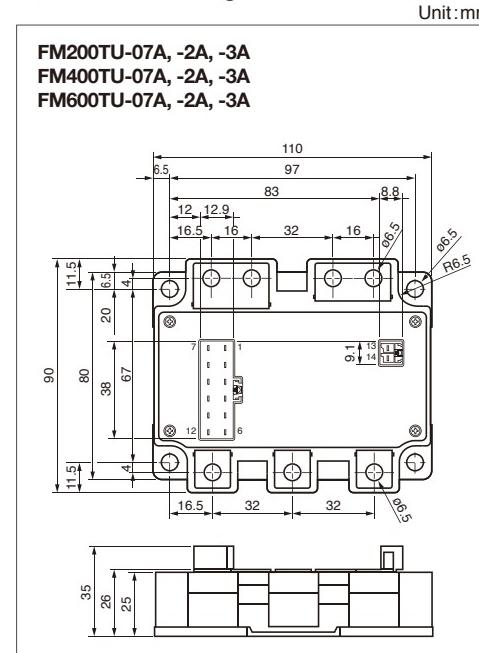
Line-up of MOSFET Modules

IGBT Modules

■ Series Matrix of MOSFET Modules

V _{DSS} I _D (A)	75V	Connection	100V	Connection	150V	Connection
100	FM200TU-07A	T	FM200TU-2A	T	FM200TU-3A	T
200	FM400TU-07A	T	FM400TU-2A	T	FM400TU-3A	T
300	FM600TU-07A	T	FM600TU-2A	T	FM600TU-3A	T
Connection						

■ Outline Drawing of MOSFET Modules



RoHS directive compliant



New Products

New lineup contributes to simplifying design, downsizing, energy-saving s of industrial inverters.

IGBT Module T/T1-Series

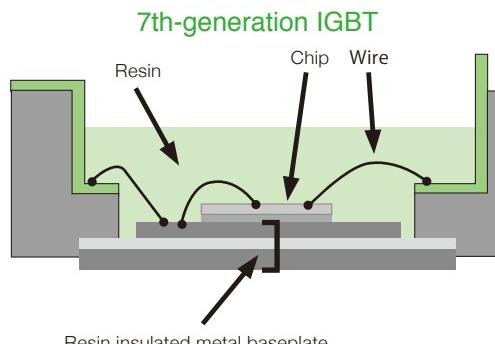
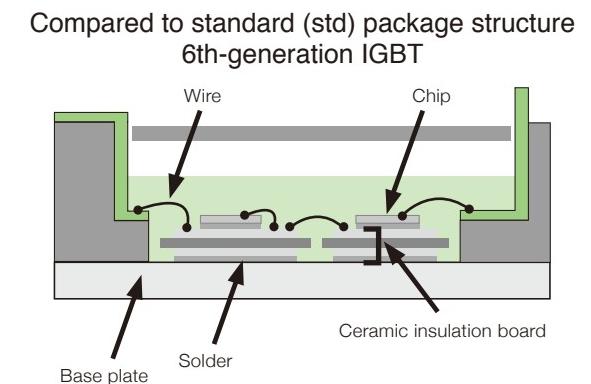
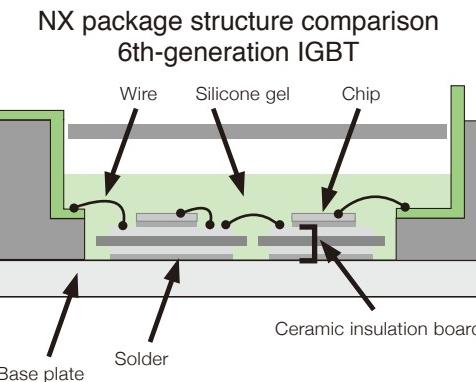
<Main Features>

- New modules equipped with three-phase converter, inverter, and brake circuit(CIB), contributes to simplifying design for inverter systems
- CIB modules contribute to compact inverter systems by reducing package size by 36% compared to the Mitsubishi Electric's existing module.(CIB)
- Power loss has been reduced with the introduction of the 7th-generation IGBT produced using CSTBT™² and a diode incorporating a relaxed field of cathode (RFC) structure
- The new structure introduced eliminates the solder-attached section, increasing the thermal cycle lifetime, which contributes to improving the reliability of inverters
- The introduction of press-fit pins and PC-TIM¹ contribute to simplifying the assembly process for inverters

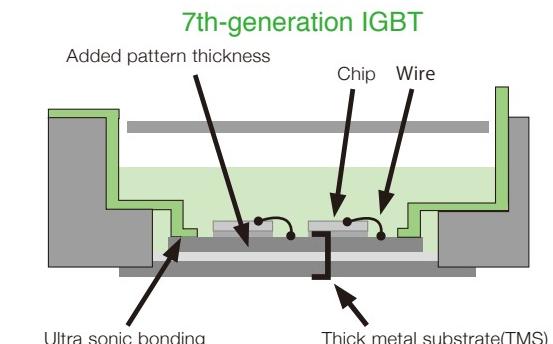
*1 PC-TIM: Phase change - thermal interface material

*2 CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect

■ New structure realizes improved reliability (improved thermal cycle lifetime)



※Adopts SoLid Cover(SLC) Technology



※Standard package is not available for CIB

◆ Press-fit terminal support (NX)

- Possible to select the control pin shape (soldered terminals/press-fit terminals)
- Solder attachment process eliminated

■ Press-fit pin





Feature Products

Contributes to realizing smaller, energy-saving large-capacity inverters

Power Modules for 3-level Inverters

- <Main Features>
- Compatible with 3-level inverters, reducing power consumption approx. 30%¹⁾
- New package developed²⁾ contributing to lower inductance and simplified inverter circuit structure
- IGBT specifications optimized³⁾ with development of new compact, low-inductance package
- 4-in-1⁴⁾ and 1-in-1/2-in-1⁵⁾ lineup contributes to improved compactness and freedom in inverter design

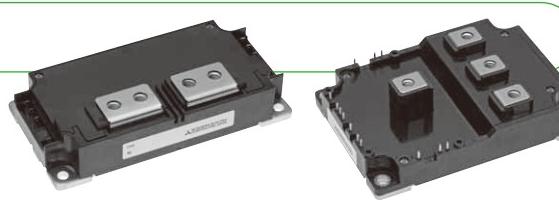
¹⁾ Comparison between 3-level inverter incorporated in this device and 2-level inverter in conventional device.

²⁾ 1-in-1/2-in-1 type external dimensions of 130x67mm, 4-in-1 type external dimensions of 115x82mm, new package developed with innovative terminal positioning.

³⁾ IGBT specifications optimized for 3-level inverters, adopting CSTBT™ (Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect).

⁴⁾ 4-in-1 module with one 3-level inverter arm in one package.

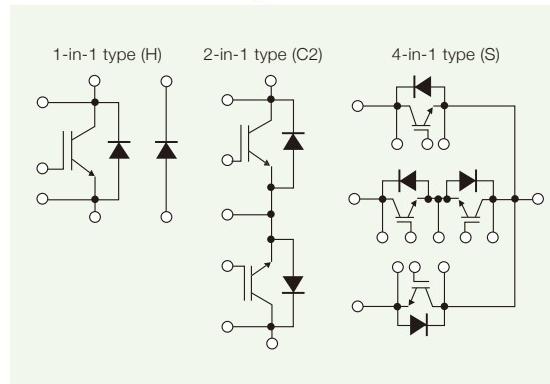
⁵⁾ Bidirectional switch model as emitter common connection.



1-in-1 / 2-in-1 type

4-in-1 type

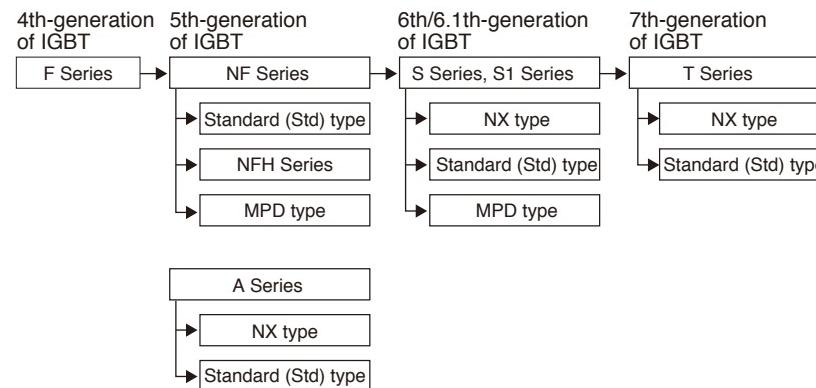
Internal circuit diagram



Lineup

Main application	Model	Module type	Rated voltage	Rated current	Circuit structure	External dimensions W×D(mm)
125-500kW inverter	CM400ST-24S1	IGBT	1200V	400A	4-in-1	115×82
	CM1400HA-24S	IGBT	1200V	1400A	1-in-1	130×67
	RM1400HA-24S	Diode	1200V	1400A	1-in-1	130×67
	CM1000HA-34S	IGBT	1700V	1000A	1-in-1	130×67
	CM500C2Y-24S	IGBT	1200V	500A	2-in-1	130×67

Evolution of IGBT Module Series



Features of IGBT Module Series

S Series

- Lineup includes various package types
- 6th-generation CSTBT™ delivers low-loss performance
- Thinner package (Height: 17mm) (NX type)
- Suited to large-capacity applications (MPD type)

MPD: Mega power dual

Type Name Definition of IGBT Modules

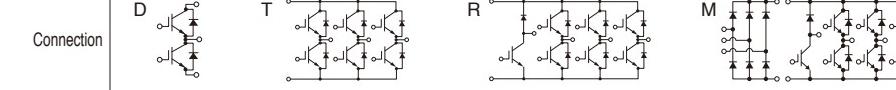
CM 600 D Y -13 T

- Series name
- Voltage class
- Outline drawing and other specifications
- Connection type
- Rated current capacity
- IGBT module

Matrix of IGBT Modules 650V/600V (No.: Number of outline drawing, see page 19 to 20)

RoHS directive (2011/65/EU) compliant

V _{CE(S)V}	Series	650V				600V					
		T/T1-Series I _C (A) NX Type	Connection No.	T-Series std Type NX Type	Connection No.	A-Series NX Type	Connection No.	NF-Series NX Type	Connection No.	NF-Series NFH Type	Connection No.
50		CM50MXUB-13T** CM50MXUB-13T1** CM50MXUBP-13T** CM50MXUBP-13T1**	M 42 M 42 M - M -								
75		CM75MXUB-13T** CM75MXUB-13T1** CM75MXUBP-13T** CM75MXUBP-13T1**	M 42 M 42 M - M -			CM75MX-12A	M 01	CM75TL-12NF CM75RL-12NF	T 07 R 07		
100		CM100TX-13T* CM100TPX-13T* CM100MXUB-13T** CM100MXUB-13T1** CM100MXUBP-13T** CM100MXUBP-13T1** CM100MXUD-13T** CM100MXUD-13T1** CM100MXUDP-13T** CM100MXUDP-13T1**	T 33 T 37 M 42 M 42 M - M - M 44 M 44 M - M -	CM100DY-13T*	D 30	CM100MX-12A CM100RX-12A	M R 01 02	CM100TL-12NF CM100RL-12NF	T R 07 07	CM100DUS-12F	D 13
150		CM150TX-13T* CM150TPX-13T* CM150RX-13T* CM150RXP-13T* CM150MXUD-13T** CM150MXUD-13T1** CM150MXUDP-13T** CM150MXUDP-13T1**	T 33 T 37 R 34 R 38 M 44 M 44 M - M -	CM150DY-13T*	D 30	CM150RX-12A	R 02	CM150DY-12NF CM150TL-12NF CM150RL-12NF	D T R 08 07 07	CM150DUS-12F	D 13
200		CM200TX-13T* CM200TPX-13T* CM200RX-13T* CM200RXP-13T*	T 33 T 37 R 34 R 38	CM200DY-13T*	D 30	CM200RX-12A	R 02	CM200DY-12F CM200TL-12NF CM200RL-12NF	D T R 08 09 09	CM200DU-12NFH	D 13
225											
300		CM300DX-13T* CM300DXP-13T*	D 28 D 39	CM300DY-13T*	D 31	CM300DX-12A	D 03	CM300DY-12NF	D 08	CM300DU-12NFH	D 14
400				CM400DY-13T*	D 31	CM400DX-12A	D 03	CM400DY-12NF	D 10	CM400DU-12NFH	D 14
450		CM450DX-13T* CM450DXP-13T*	D 28 D 39								
600		CM600DX-13T* CM600DXP-13T*	D 28 D 39	CM600DY-13T*	D 32			CM600DY-12NF	D 11	CM600DU-12NFH	D 15
1000											



★: Under Development ★: New Product

Non-recommended: Please contact to the sales offices.

Matrix of Power Modules for 3-level Inverter (No.: Number of outline drawing, see page 22 to 23)

RoHS directive (2011/65/EU) compliant

V _{CE(S)V} /V _{RRM}	1200 V IGBT Module			1700 V IGBT Module			1200 V Diode Module			1700 V Diode Module		
	I _C /I _F	T/S/S1-Series std Type	Connection No.	S/S1-Series std Type	Connection No.	S/S1-Series std Type	Connection No.	S/S1-Series std Type	Connection No.	S/S1-Series std Type	Connection No.	
400		CM400ST-24S1*	S C1 35									
450		CM450C1Y-24T**	C1 32									
500		CM500C2Y-24S*	C 36									
600		CM600C1Y-24T*	C1 32	CM600HA-34S*	H 36							
800				CM800HA-34S*	H 36							
1000				CM1000HA-34S*	H 36							
1400		CM1400HA-24S*	H 36	RM1400HA-24S*	H 36							
	Connection	IGBT module	C1 C2 H S				Diode module	H D				

* Connection of diode module and IGBT module are different.

★: Under Development ★: New Product

Features of IGBT Module Series

NFH Series

- High-speed CSTBT™ delivers low-loss performance
- Soft switching (resonant) turn-off function (ZVS)
- Enhanced inner wiring (skin effect)

CSTBT™: Mitsubishi Electric's unique IGBT that makes use of the carrier cumulative effect.

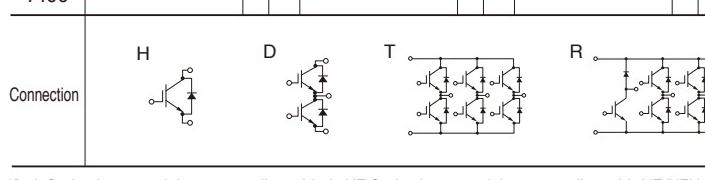
Line-up of IGBT Modules

■ Matrix of IGBT Modules 1200V (No.: Number of Outline Drawing, see page 19 to 23)

RoHS directive (2011/65/EU) compliant

V _{CES} (V)	Series	1200V										
		T/T1-Series NX Type		T-Series std Type		S/S1-Series NX Type		S/S1-Series std Type		S/S1-Series MPD Type		A-Series ^{※1} NF-Series ^{※1}
I _c	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.
35	CM35MXUA-24T**	M 41				CM35MXUA-24S	M 04					
	CM35MXUA-24T1**	M 41										
	CM35MXUAP-24T**	M -										
	CM35MXUAP-24T1**	M -										
50	CM50MXUA-24T**	M 41				CM50MXUA-24S	M 04				CM50RL-24NF	R 07
	CM50MXUA-24T1**	M 41									CM50TL-24NF	T 07
	CM50MXUAP-24T**	M -										
	CM50MXUAP-24T1**	M -										
75	CM75MXUB-24T**	M 42				CM75MXUA-24S	M 04				CM75RL-24NF	R 07
	CM75MXUB-24T1**	M 42									CM75TL-24NF	T 07
	CM75MXUBP-24T**	M -				CM75TX-24S	M 04					
	CM75MXUBP-24T1**	M -				CM75RX-24S	M 05					
	CM75MXUC-24T**	M 43					M 02					
	CM75MXUC-24T1**	M 43										
	CM75MXUCP-24T**	M -										
100	CM100TX-24T*	T 33				CM100MXA-24S	M 04				CM100DY-24A	D 08
	CM100TP-24T*	T 37				CM100TX-24S1	M 04				CM100DY-24NF	D 08
	CM100RX-24T*	R 34					T 25				CM100E3Y-24NF	E3 08
	CM100XP-24T*	R 38				CM100RX-24S1	R 26				CM100RL-24NF	R 07
	CM100MXUC-24T**	M 43									CM100TL-24NF	T 07
	CM100MXUC-24T1**	M 43									CM100DU-24NFH	D 13
	CM100MXUCP-24T**	M -										
150	CM150TX-24T*	T 33				CM150DX-24S	D 03				CM150DY-24A	D 08
	CM150TP-24T*	T 37				CM150EXS-24S	E 24				CM150DY-24NF	D 08
	CM150RX-24T*	R 34				CM150TX-24S1	T 25				CM150E3Y-24NF	E3 08
	CM150XP-24T*	R 38				CM150RX-24S1	R 26				CM150RL-24NF	R 09
	CM150MXUD-24T**	M 44									CM150TL-24NF	T 09
	CM150MXUD-24T1**	M 44									CM150DU-24NFH	D 13
	CM150MXUDP-24T**	M -										
200	CM200TX-24T*	T 33				CM200DY-24T*	D 31				CM200DY-24A	D 08
	CM200TP-24T*	T 37				CM200EXS-24S	E 24				CM200DY-24NF	D 10
						CM200RXL-24S	R 21				CM200RL-24NF	R 09
225	CM225DX-24T*	D 28				CM225DX-24S1	D 27				CM200TL-24NF	T 09
	CM225DXP-24T*	D 39									CM200DU-24NFH	D 14
300	CM300DX-24T*	D 28				CM300DY-24T*	D 31				CM300DY-24A	D 10
	CM300DXP-24T*	D 39				CM300DX-24S1	D 27				CM300DY-24NF	D 11
						CM300EXS-24S	E 24				CM300DU-24NFH	D 14
400						CM300RXL-24S1*	R 21					
450	CM450DX-24T*	D 28				CM450DY-24T*	D 32				CM400DY-24A	D 11
	CM450DXP-24T*	D 39				CM450DX-24S1	D 27				CM400HA-24A	H 16
						CM450DY-24S	D 11				CM400DY-24NF	D 11
600	CM600DX-24T*	D 28				CM600DY-24T*	D 32				CM400DU-24NFH	D 15
	CM600DXP-24T*	D 39				CM600DX-24S1	D 27					
						CM600DXL-24S	D 6					
800												
900												
1000	CM1000DX-24T*	D 29				CM1000DXL-24S	D 06				CM900DUC-24S	D 17
	CM1000DXP-24T*	D 40										
						CM1400HA-24S*	H 36					
1400						CM1400DUC-24S	D 17					

Connection H D T R M E E3



*1: A-Series have model name ending with A, NF-Series have model name ending with NF/NFH

★: Under Development ★: New Product

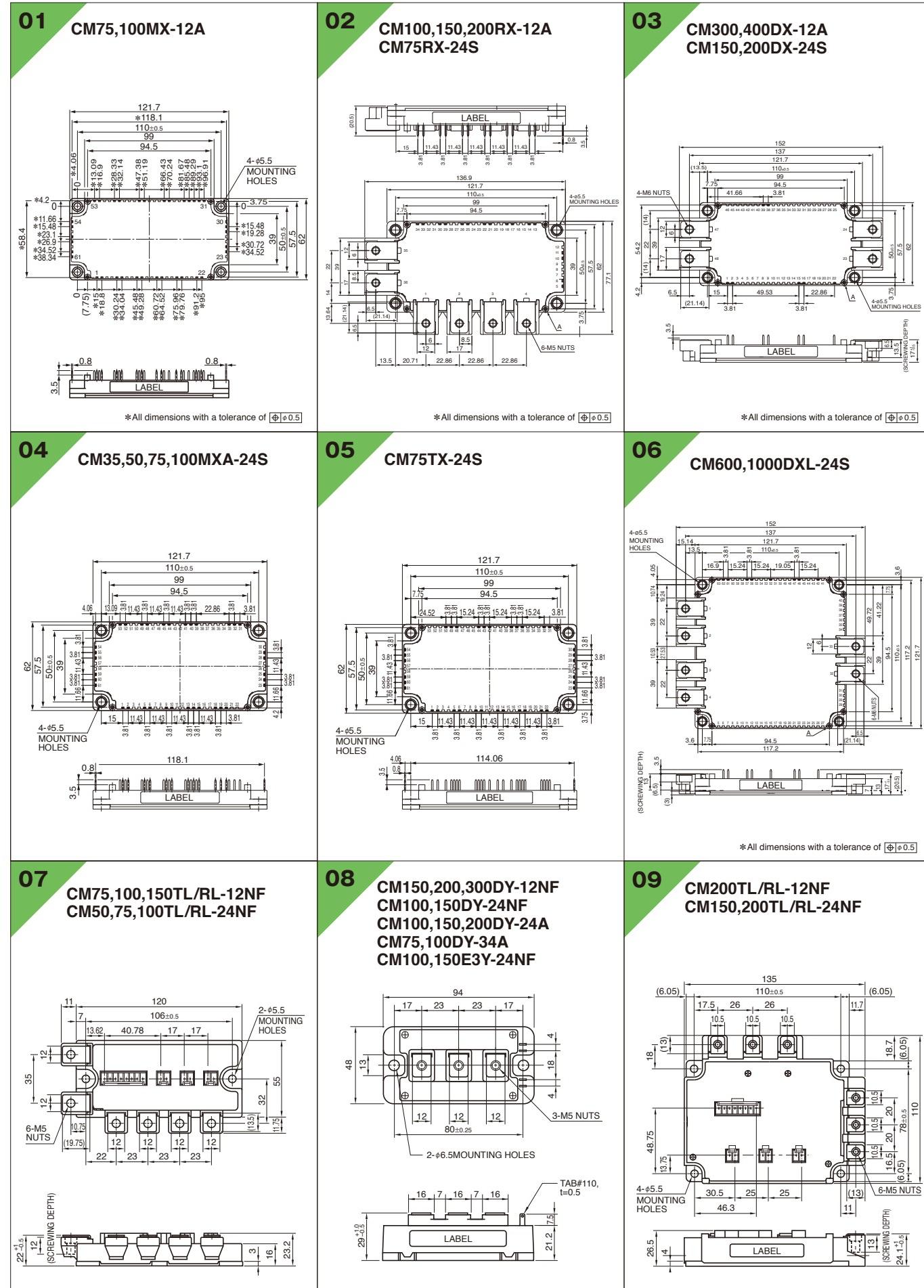
■ Matrix of IGBT Modules 1700V

RoHS directive (2011/65/EU) compliant

V _{CES} (V)	Series	1700V										
		T-Series NX Type		T-Series std Type		S/S1-Series NX Type		S/S1-Series std Type		S/S1-Series MPD Type		A-Series std Type
I _c	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.	Connection No.
35												
50												
75												
100	CM100TX-34T**	T 33	CM100TXP-34T**	T 37	CM100DY-34T**	D 30	CM100DY-34T**	D 30	CM100DY-34A	D 08		
150	CM150TX-34T**	T 33	CM150TXP-34T**	T 37	CM150DY-34T**	D 31	CM150DX-34SA</					

Line-up of IGBT Modules

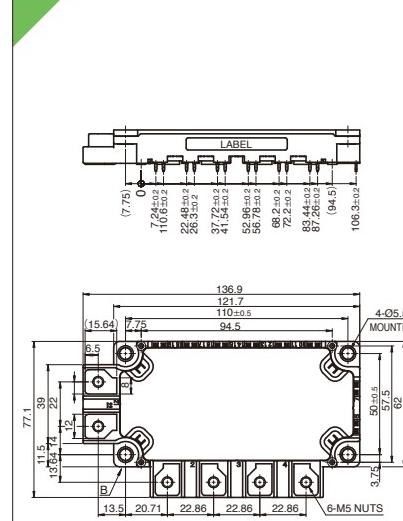
Outline Drawing of IGBT Modules



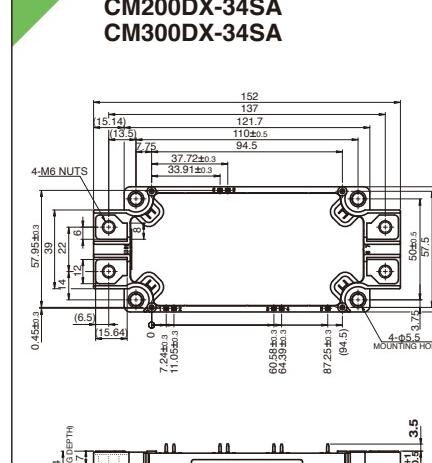
Line-up of IGBT Modules

■ Outline Drawing of IGBT Modules

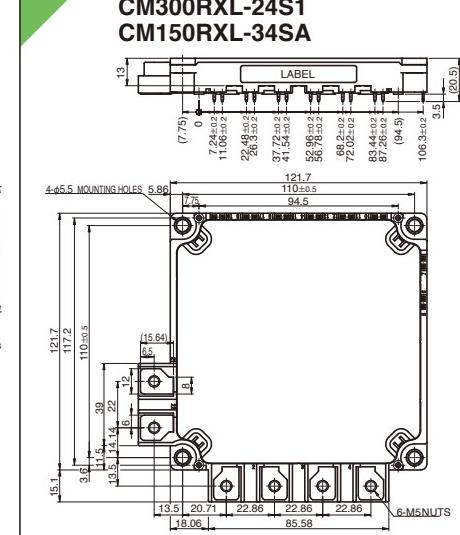
19 CM75RX-34SA



20 CM150DX-34SA
CM200DX-34SA
CM300DX-34SA



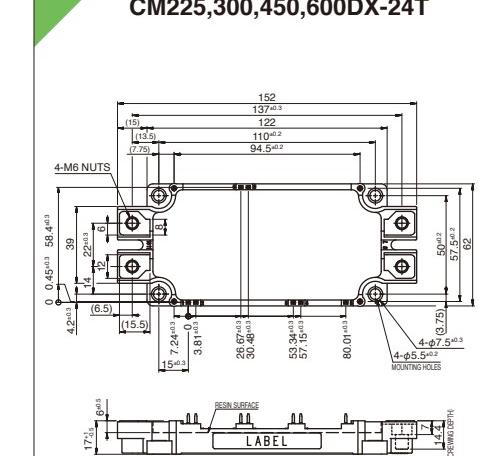
21 CM200RXL-24S
CM300RXL-24S1
CM150RXL-34SA



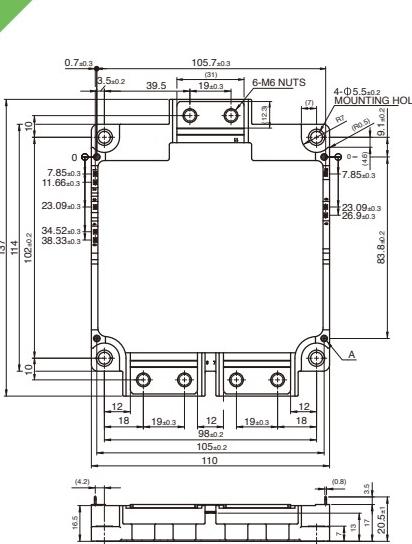
Unit:mm

■ Outline Drawing of IGBT Modules

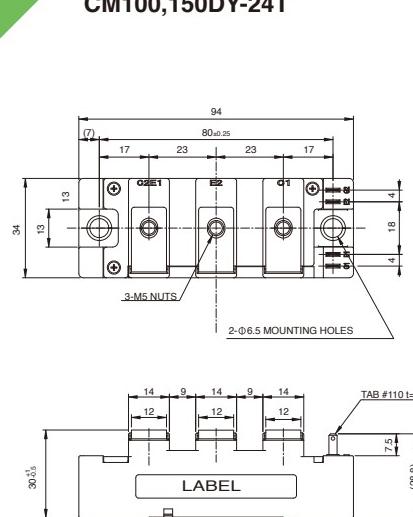
28 CM300,450,600DX-13T
CM225,300,450,600DX-24T



29 CM1000DX-24T

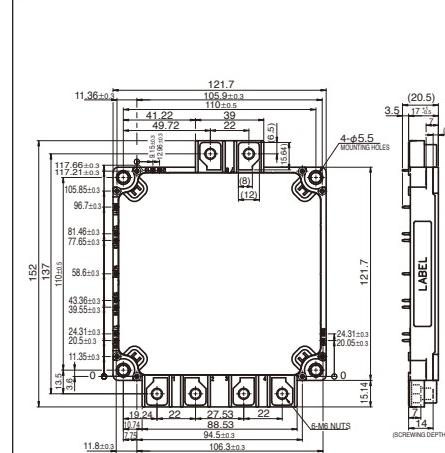


30 CM100,150,200DY-13T
CM100,150DY-24T

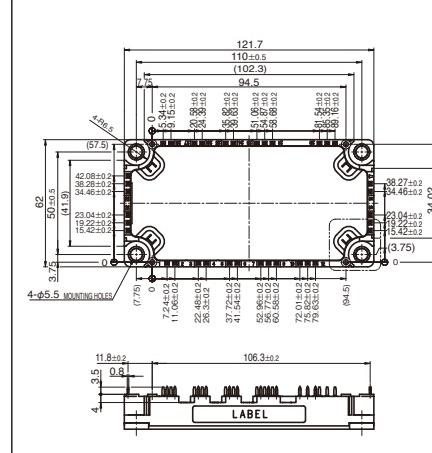


Unit:mm

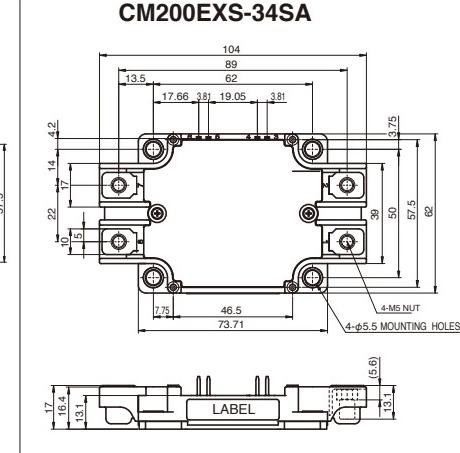
22 CM450DXL-34SA
CM600DXL-34SA



23 CM75Mxa-34SA

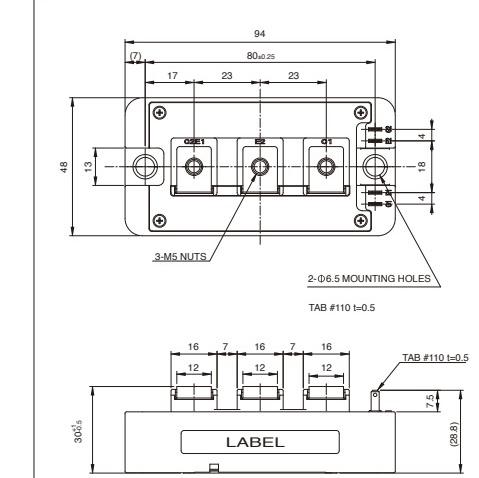


24 CM150EXS-24S
CM200EXS-24S
CM300EXS-24S
CM200EXS-34SA

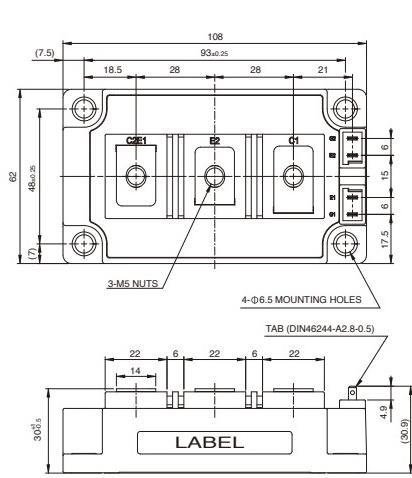


Unit:mm

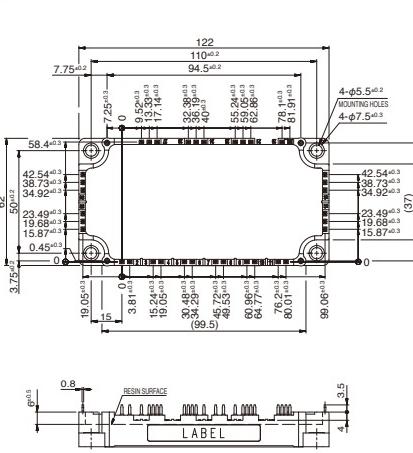
31 CM300,400DY-13T
CM200,300DY-24T



32 CM600DY-13T
CM450,600DY-24T
CM450,600C1Y-24T

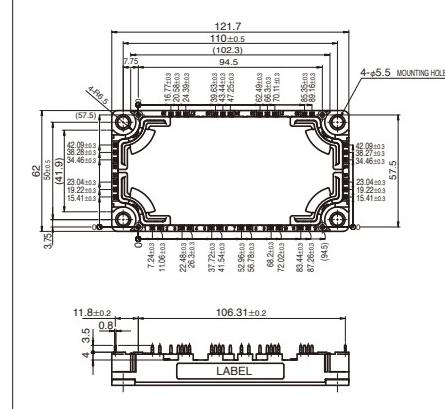


33 CM100,150,200TX-13T
CM100,150,200TX-24T
CM100,150TX-34T

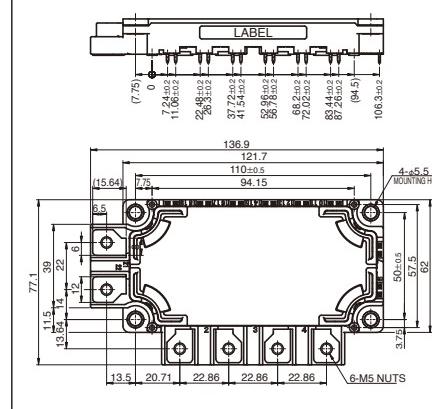


Unit:mm

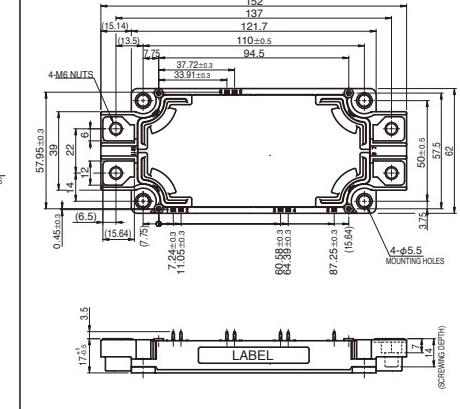
25 CM100TX-24S1
CM150TX-24S1



26 CM100RX-24S1
CM150RX-24S1

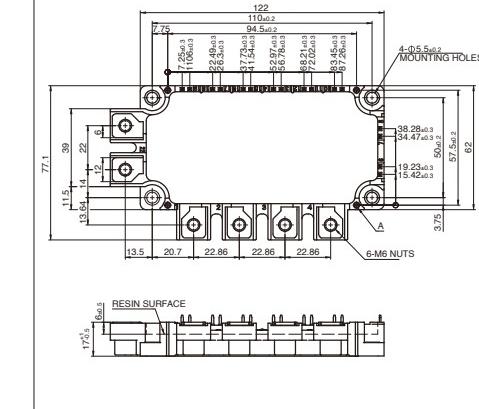


27 CM225DX-24S1
CM300DX-24S1
CM450DX-24S1
CM600DX-24S1

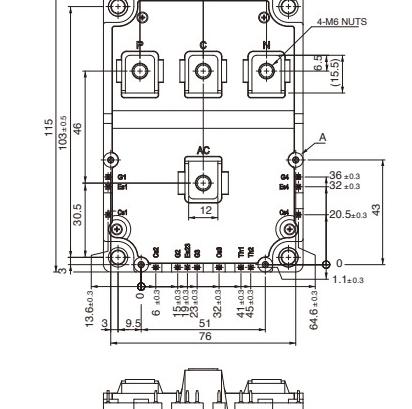


Unit:mm

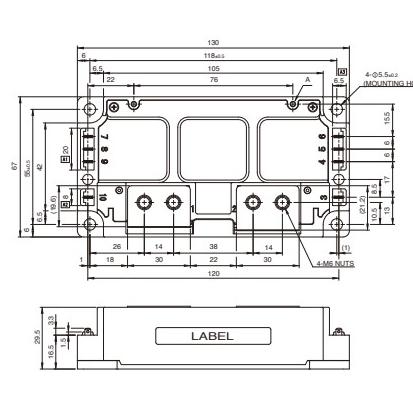
34 CM150,200RX-13T
CM100,150RX-24T



35 CM400ST-24S1



36 CM500C2Y-24S
CM1400HA-24S
CM1000HA-34S
RM1400HA-24S

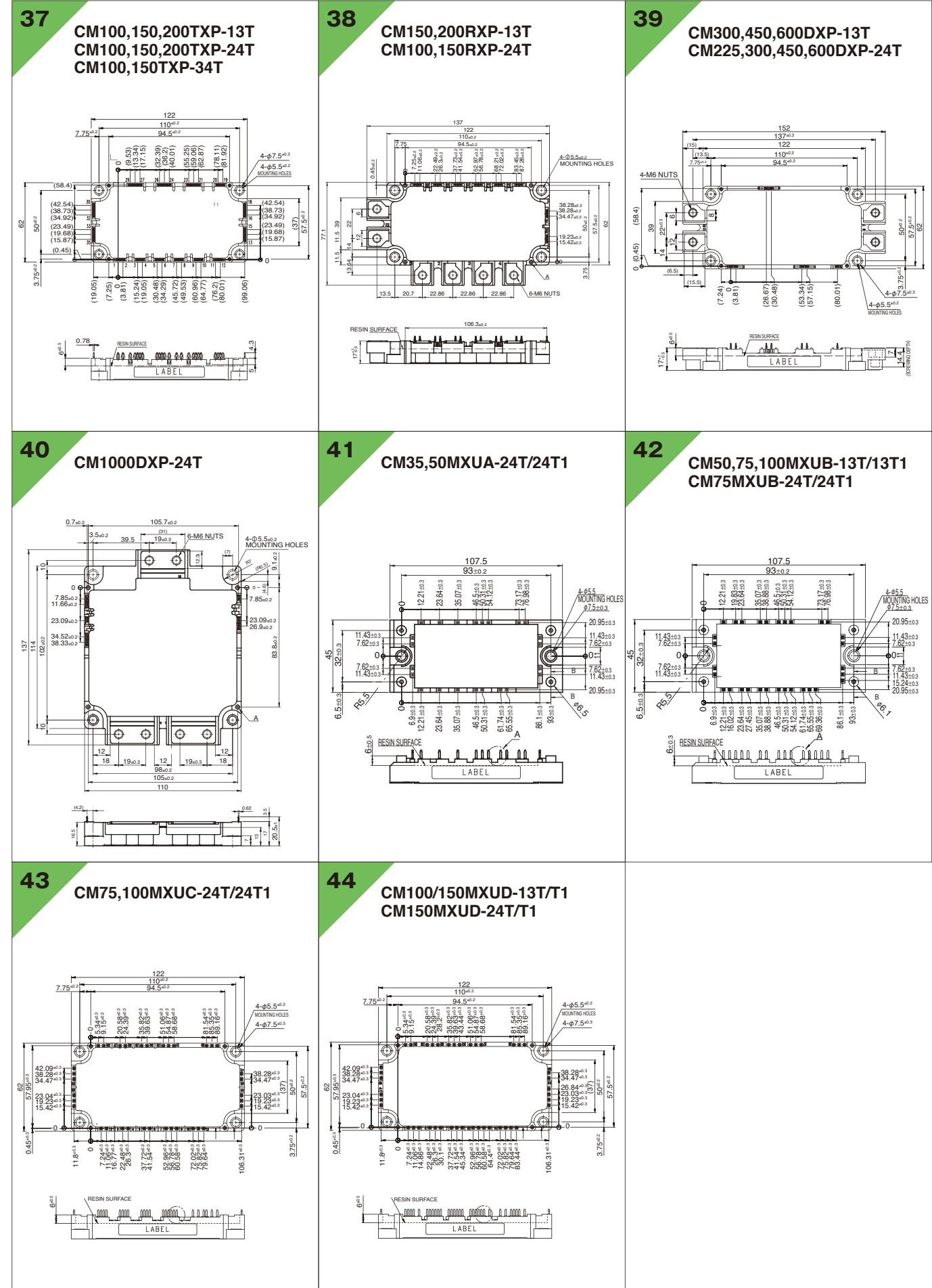


Unit:mm

Line-up of IGBT Modules

HVIGBT Modules

Outline Drawing of IGBT Modules



New Products

X Series HVIGBT Modules

Existing compatible package: Standard type
Contributes to smaller, higher-capacity inverter systems by expanding lineup

	std. Type	
1.7kV	2400A/3600A	1600A/2400A
3.3kV	1200A/1800A	1200A
4.5kV	900A/1350A/1500A	900A/1000A
6.5kV	600A/900A/1000A	600A

<Main Features>

- Power loss reduced by incorporating 7th-generation IGBT and RFC¹ diode
- Industry-leading power² for increased inverter capacity
- External size reduced 33% while maintaining the same voltage resistance and rated current as conventional products,³ contributing to inverter downsizing
- Optimal package internal structure realizes improved heat dissipation, humidity resistance and flame retardance, increasing product life

*1 RFC : Relaxed field of cathode

*2 3.3kV - 6.5kV (as of Apr. 5, 2018 based on Mitsubishi Electric research)

*3 Comparison of X Series 1200HC-66X and H Series CM1200HC-66H

New common frame package: LV100/HV100 type
Class-leading current density contributes to increased power output in inverter systems

	LV100 Type	HV100 Type
1.7kV	1000A/1200A	
3.3kV	450A/600A	450A/600A
6.5kV	225A/300A	

<Main Features>

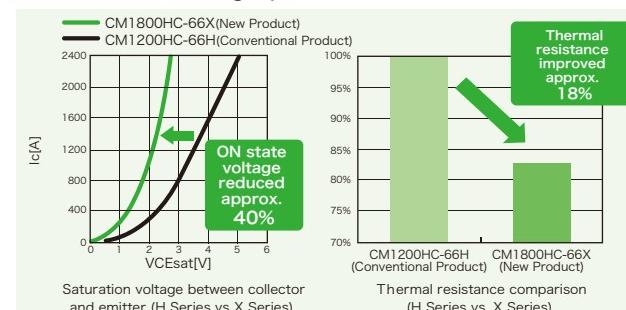
- Power loss reduced by incorporating 7th-generation IGBT and RFC¹ diode
- Industry's highest 3.3kV/600A Si module power density of 8.57A/cm²⁴
- contributes to increased power output and efficiency
- Terminal layout optimized for easy paralleling and flexible inverter configurations and capacities
- New package structure offers extra reliability

*4 As of Apr. 5, 2018, based on Mitsubishi Electric research

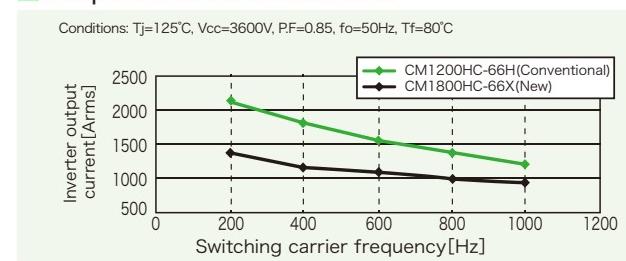
Positioning from conventional series



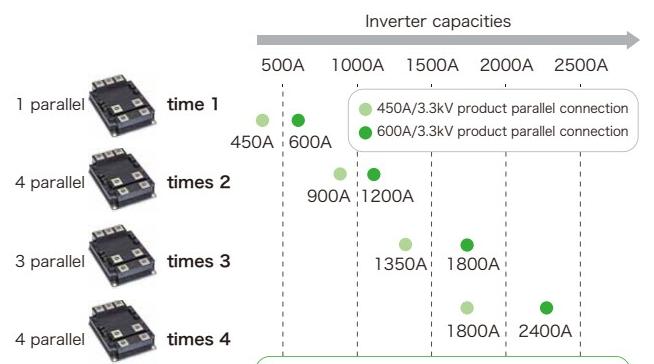
Characteristics graph



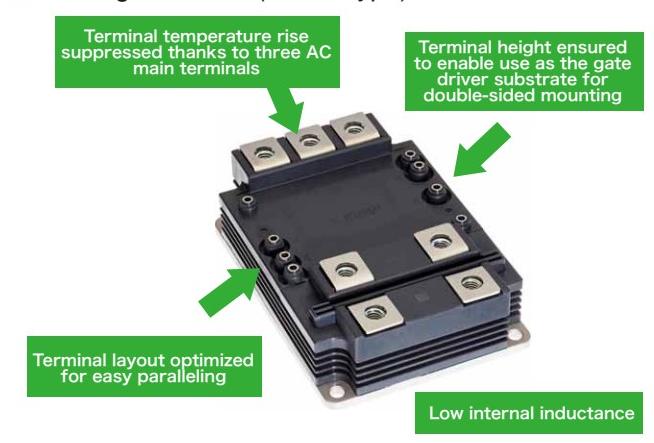
Output current characteristics



Various current ratings for optimal system design



Package features (LV100 type)



Line-up of HVIGBT Modules

■ Series Matrix of HVIGBT/HVIPM (No.: Number of outline drawing, see page 26 and 27)

[Type] A: Al base plate / 6 kViso B: Cu base plate C: AlSiC base plate / 6 kViso D: AlSiC base plate / 10kViso E: Al base plate / 10kViso

★★: Under Development

*There are possibility to change the type of auxiliary terminal:

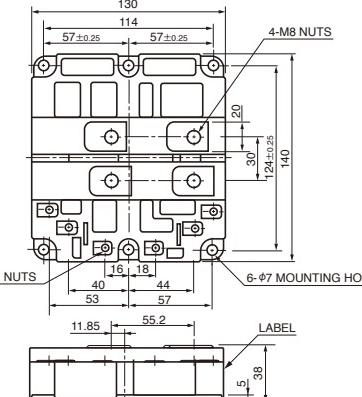
■ Series Matrix of HVDIODE Modules (No.: Number of outline drawing, see page 28)

[Type] B: Cu base plate, C: AlSiC base plate / 6 kViso, D: AlSiC base plate / 10 kViso

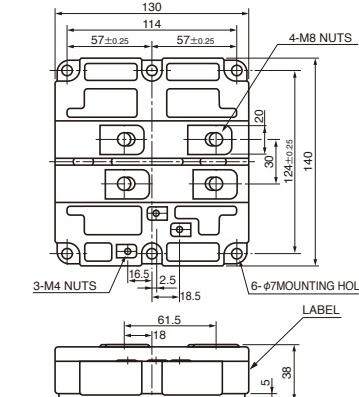
★★ Under Development

■ Outline Drawing of HVIGBT Modules

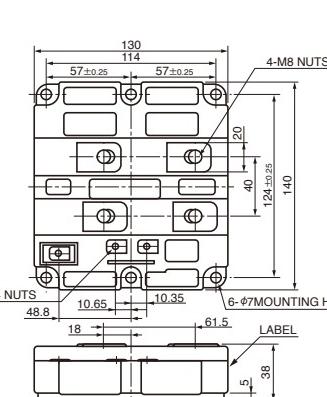
01 CM600DY-34H
CM600E2Y-34H
CM800DZ-34H
CM800DZB-34N



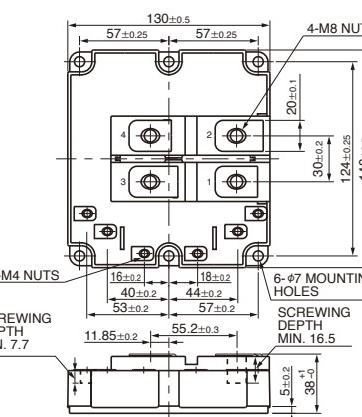
02 CM1200,1600HC-34H



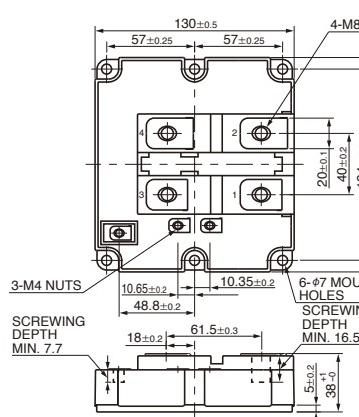
03 CM1200HCB-34N
CM800HB-50H,-66
CM800HC-66H



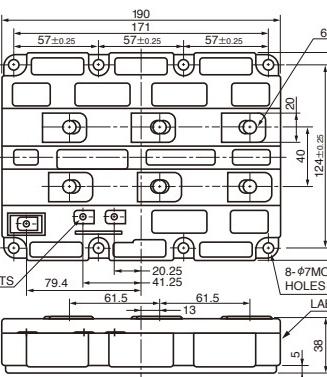
04 CM1200DB/DC-34N CM1200DC-34S



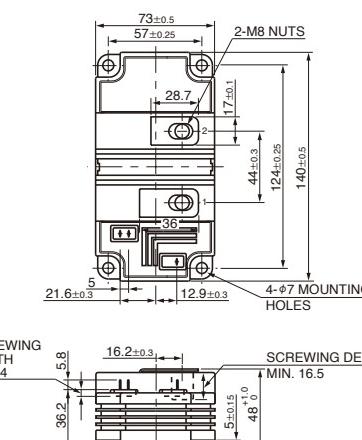
05 CM1200E4C-34N
CM1800-2400HC-34



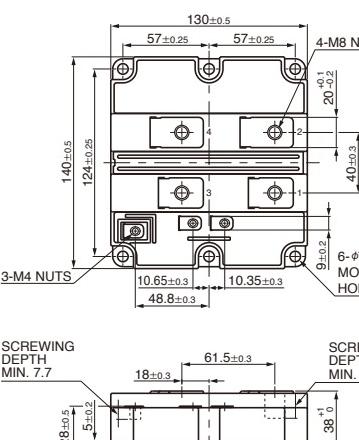
06 CM1800,2400HCB-34N
CM1800,2400HC-34H
CM1200HB/HC-50H,-66
CM800E4C/E6C-66H
CM900HB/HC-90H



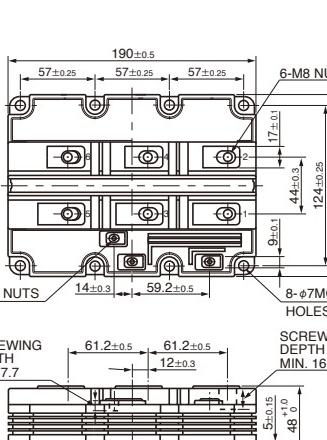
**07 CM400HG-66H
CM200HG-130H**



08 CM1000HC-66R
CM800HC-90R

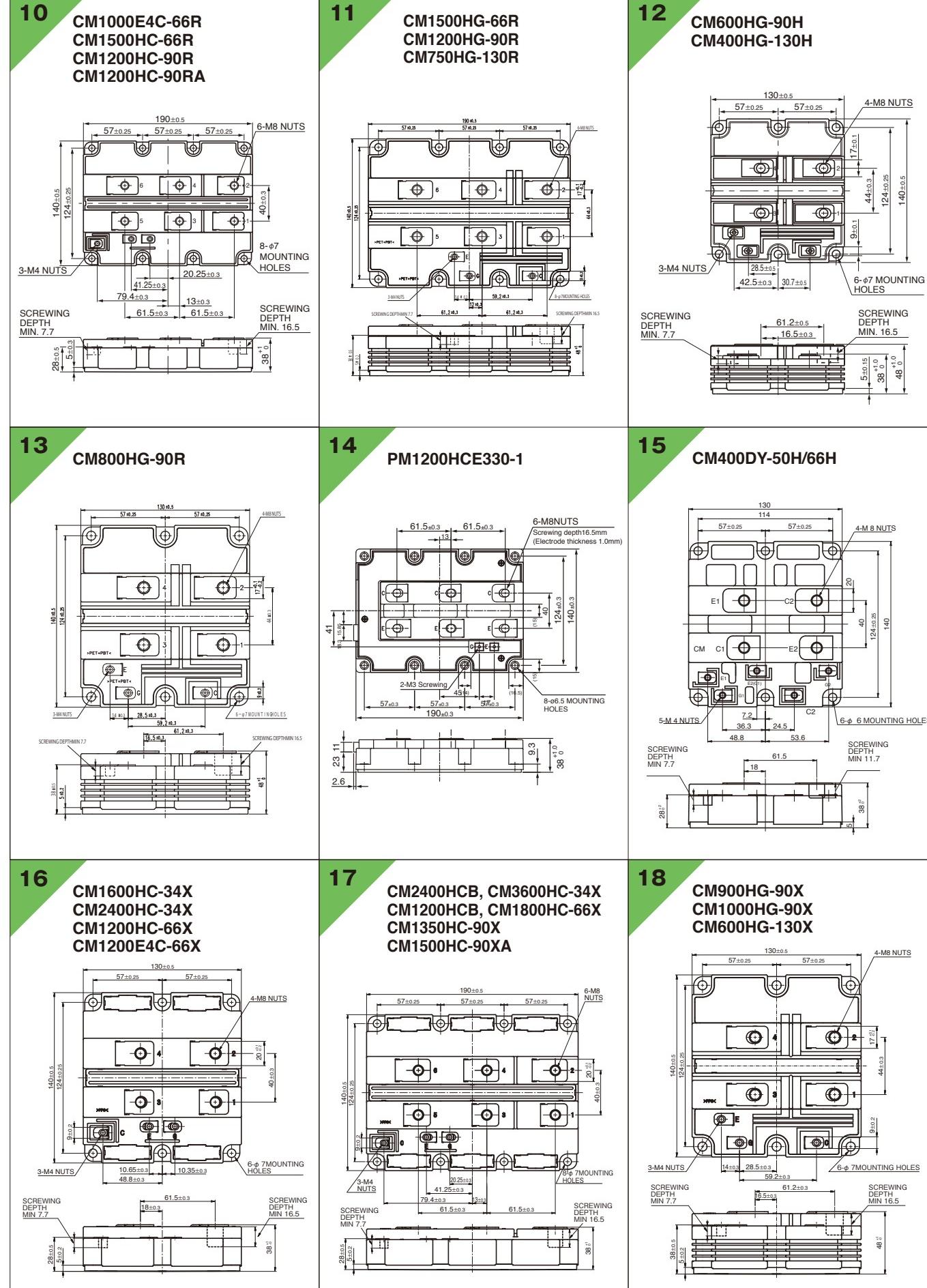


09 CM1200HG-66H
CM900HG-90H
CM400E2G/E4G-130I
CM600HG-130H

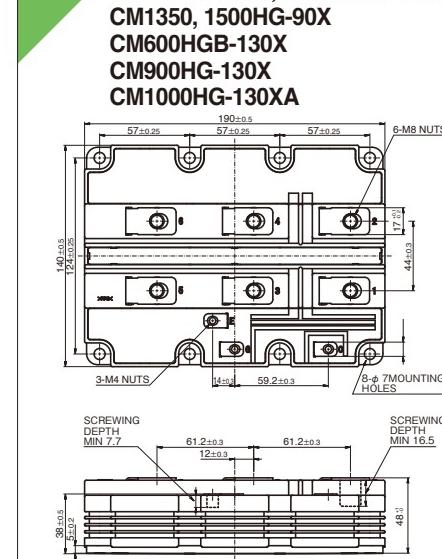


Line-up of HVIGBT Modules

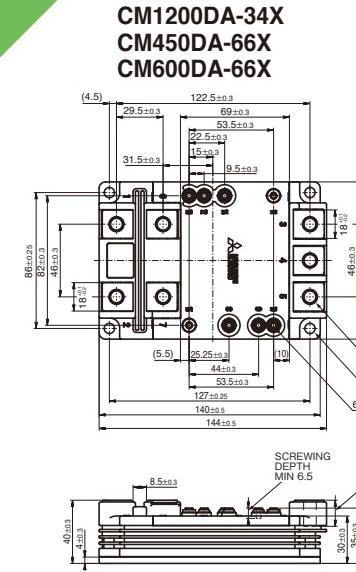
Outline Drawing of HVIGBT Modules



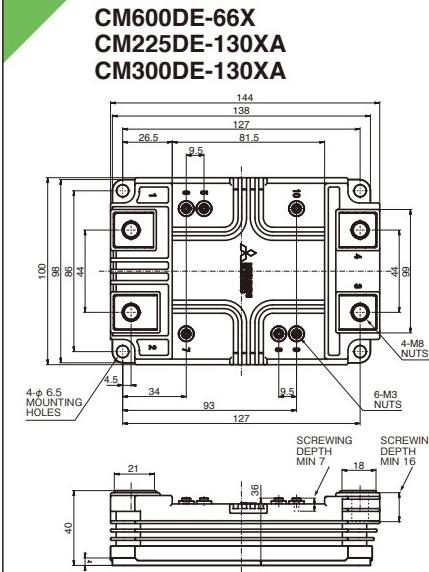
Outline Drawing of HVIGBT Modules



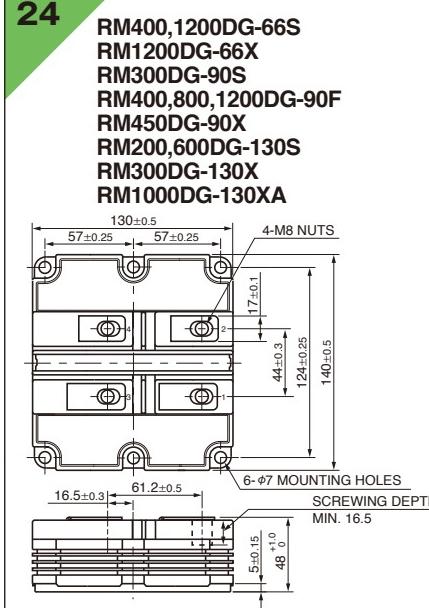
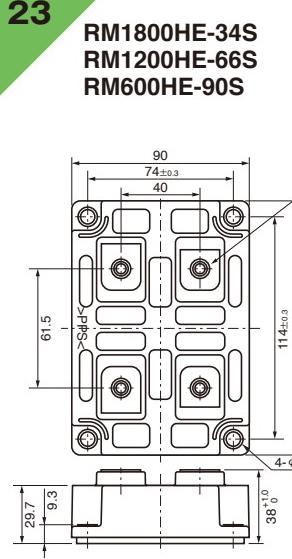
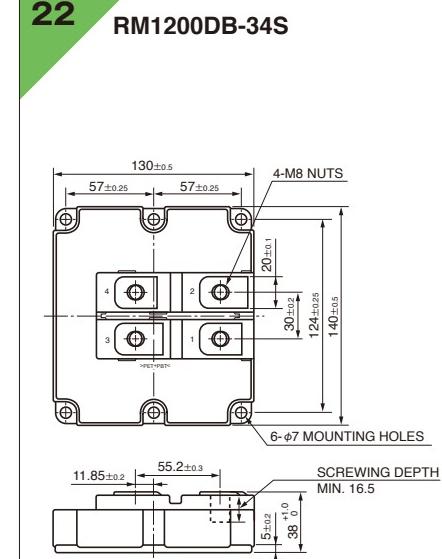
Outline Drawing of HVIGBT Modules



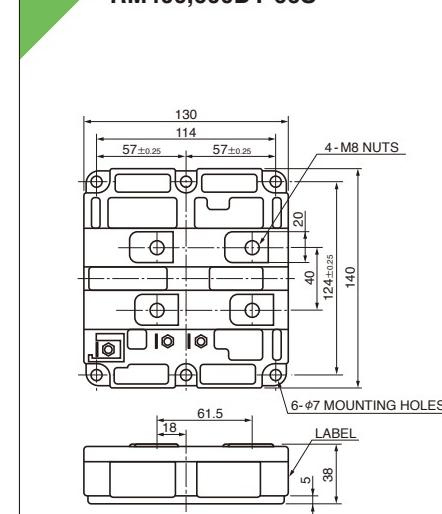
Outline Drawing of HVIGBT Modules



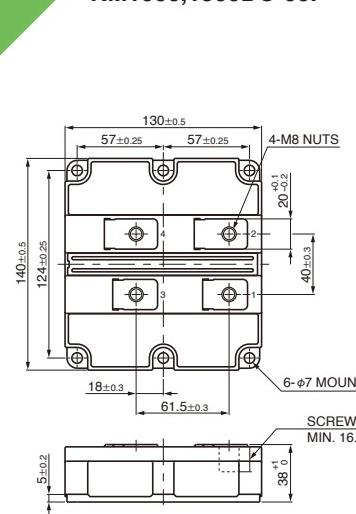
Outline Drawing of HVDIODE Modules



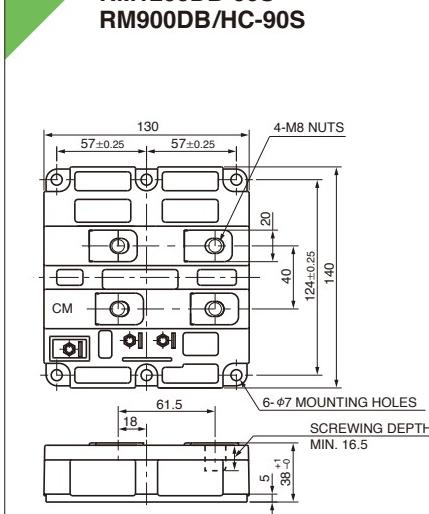
Outline Drawing of HVDIODE Modules



Outline Drawing of HVDIODE Modules



Outline Drawing of HVDIODE Modules



*There are possibility to change the type of auxiliary terminals.

Power Modules for Electric and Hybrid Vehicles



New Products

Package with 6-in-1 connection and integrated water-cooled fin contributes to more compact, high-power inverters for EVs/HEVs

High Power J1 Series Power Modules for EVs/HEVs

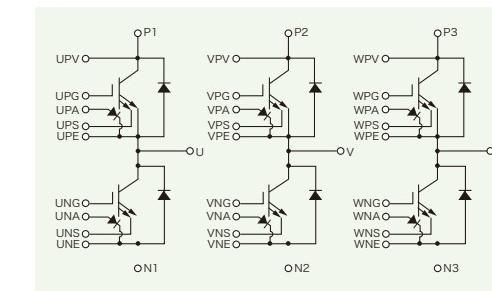
CT1000CJ1B060,
CT600CJ1B120

- <Main Features>
- Integrated direct water-cooling structure with cooling fins and 6-in-1 connection contribute to more compact inverters for EVs/HEVs
- Direct lead bonding (DLB) structure ensures high reliability
- Loss further reduced by incorporating 7th-generation IGBT built with a CSTBTM* structure
- Completely lead-free, conforms to RoHS directives (2011/65/EU)
- Suitable for a variety of electric and hybrid vehicle inverters

*CSTBTM: Mitsubishi Electric's unique IGBT that utilizes the carrier cumulative effect.



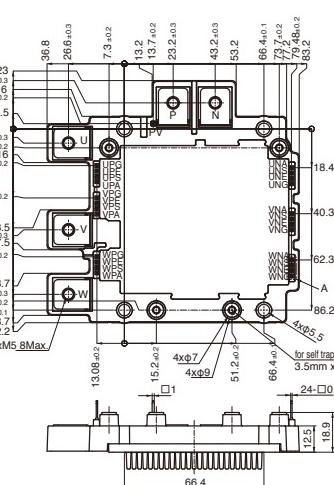
Block Diagram



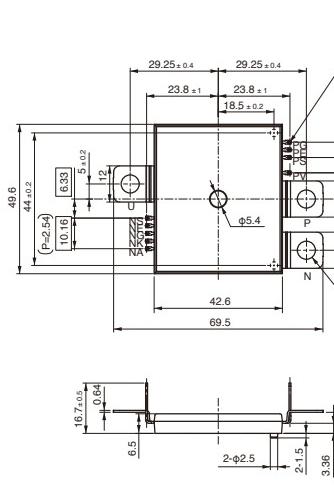
Outline Drawing of Power Modules for Electric and Hybrid Vehicles

Unit:mm

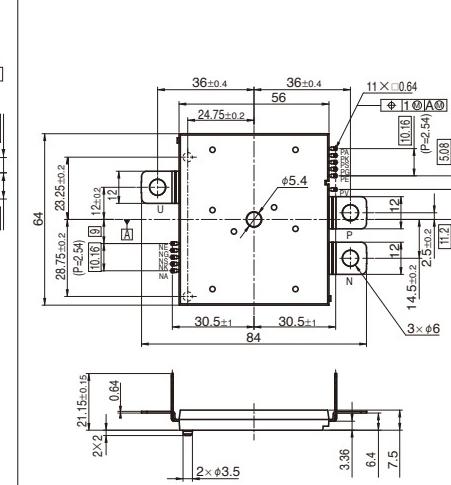
01
CT600CJ1A060
CT750CJ1A060
CT300CJ1A120



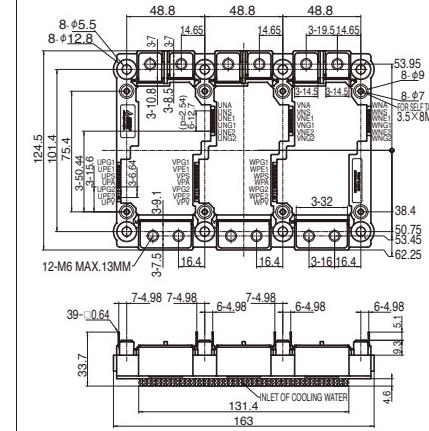
02
CT300DJG060



03
CT600DJH060



04
CT1000CJ1B060
CT600CJ1B120



Features

Common

- Long power/temperature cycle life
- High-precision on-chip temperature sensor
- High traceability in managing materials/components for each product throughout the entire production process
- Package structure compliant with the End-of-Life-Vehicles Directive, regulations relating to substances of environmental concern

J Series T-PM (Transfer-molded Power Module)

- Structure incorporates transfer molding and original direct lead bonding (DLB) technique
- DLB structure reduces internal wiring resistance and inductance
- Completely Pb-free (including the pins)

J1 Series (6-in-1)

- Cooling fin integrated direct water-cooled structure and 6-in-1 configuration contribute to minimize the automobile inverter
- DLB^{*1} structure realizes high reliability
- Installation of the 7th generation IGBT adapting the CSTBTM^{*2} structure realizes a further reduction in loss
- On-chip current sensor that enables high-speed current-cutoff protection is installed

Matrix of 650V Power Modules (No. : Number of outline drawing, please refer to page 30)

VCES(V)	650V					
	J1 Series		J Series			
Series	Power Module with pin fin	Connection	No.	T-PM	Connection	No.
300	-	-	-	CT300DJG060**	D	02
600	CT600CJ1A060	C	01	CT600DJH060**	D	03
700	CT700CJ1A060*	C	01	-	-	-
1000	CT1000CJ1B060*	C	04	-	-	-
Connection	C			D		

★: New Product ★★: Under Development

Matrix of 1200V Power Modules

(No. : Number of Outline Drawing, please refer to page 30)

VCES(V)	1200V			
	J1 Series		J Series	
Series	Power Module with pin fin	Connection	No.	
300	CT300CJ1A120**	C	01	
600	CT600CJ1B120*	C	04	
結線	C			

★: New Product ★★: Under Development

Type Name Definition of Power Modules for Electric and Hybrid Vehicles

CT 600 C J1B 120

- Voltage class
- Series name and structure
- Connection type
- Rating current class
- CT: IGBT